

# **BODY REPAIR MANUAL**

# **TACUMA**

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## TACUMA

### FOREWORD

This manual includes procedure for maintenance, adjustment, service operation and removal and installation of components.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of manual approval.

The right is reserved to make changes at any time without notice.



**DAEWOO MOTOR CO., LTD.**

INCHON, KOREA

### SECTION INDEX

**GENERAL INFORMATION**

**1**

**PREPARATIONS OF  
BODYWORK**

**2**

**WELDING AND TOOLS**

**3**

**FRONT**

**4**

**ROOF, BACK PANEL AND  
REAR FLOOR PANEL**

**5**

**FRAME DOOR OPENING, DOOR  
AND SIDE PANEL OUTER**

**6**

**FENDER, HOOD AND  
TRUNK LID**

**7**

**BODY DIMENSION**

**8**

**SEALING, CAULKING AND  
DEADNER**

**9**

**RUST PREVENTION**

**10**

**BODY-FRAME REPAIR  
EQUIPMENT**

**11**

## HOW TO USE THIS MANUAL

This manual covers the repairs of TACUMA/REZZO automobile which has been involved in accidents, and it describes the work related to the replacement of damaged body parts.

Please read through these instructions and familiarize yourself with them before actually using this manual.

**NOTE: REFER TO TACUMA/REZZO SERVICE MANUAL FOR SPECIFICATIONS, WIRE HARNESS LOCATIONS, SAFETY STAND SUPPORT POINTS, ETC.**

## SPECIAL INFORMATION

**WARNING:** Indicates a strong possibility of personal injury or equipment damage if instructions are not followed.

**NOTE:** Gives helpful information.

**CAUTION:** Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual does contain warnings and cautions against some specific service methods which could cause PERSONAL INJURY, or could damage a vehicle or make it unsafe. Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by DAEWOO might be done or of the possible hazardous consequences of each conceivable way, not could DAEWOO investigate all such ways. Anyone using service procedures or tools, whether or not recommended by DAEWOO, must satisfy himself thoroughly that neither personal safety or tools, whether or not recommended by DAEWOO, must satisfy himself thoroughly that neither personal safety or vehicle safety will be jeopardized.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice. No part of this publication may be reproduced, stored in retrieval system, or transmitted, in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. This includes text, figures and tables.



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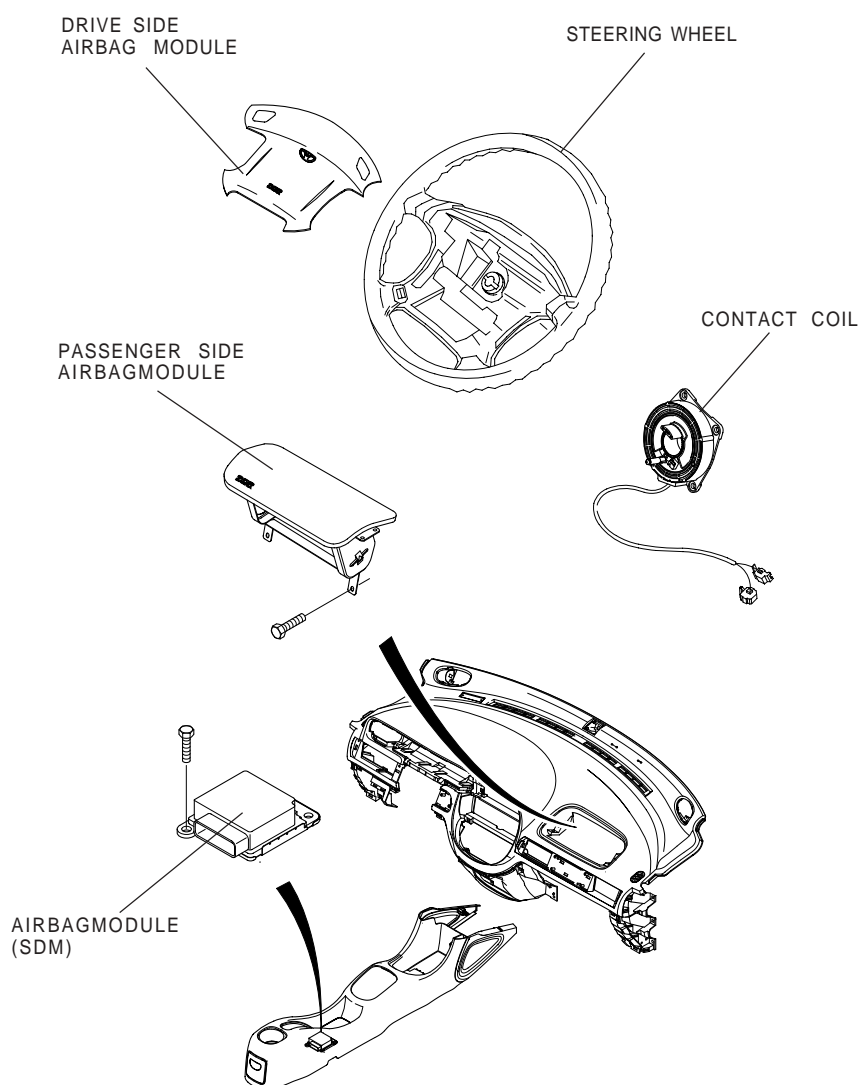
## SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

**NOTICE:** The following precautions should be observed when performing sheet metal work, paint work and repair work around the locations of the SRS parts.

1. SDM(Sensing and Diagnosis Module) are located under the console ass'y. Avoid strong impact with ass'y hammer or other tools when repairing the front side frame and the lower part of the dashboard. Do not apply heat to these areas with a gas burner, etc.
2. SRS harness is located under the lower part of the dashboard below the dashboard panel. (SRS harness is covered with a yellow corrugated tube.) Care should be taken not to damage the harness when repairing this area.

3. Do not apply heat of more than 80°C(176°F) when drying painted surfaces anywhere around the locations of SRS parts.
4. If strong impact or high temperature needs to be applied to the areas around the locations of SRS parts, remove the part before performing repair work.
5. If any of the SRS related parts is damaged or deformed, be sure to replace it.

**NOTE:** Refer to the Service Manual(Supplemental Restraint System) for removal and replacement of SRS related parts.



## SECTION 1

# GENERAL INFORMATION

### CONTENTS

GENERAL INSTRUCTION .....	1-2
IMPORTANT SAFETY NOTICE .....	1-2
BODY SAFETY .....	1-3
LOADS ON BODY PARTS .....	1-3
USE OF NEW HIGH-QUALITY MATERIALS .....	1-3
CORROSION PROTECTION.....	1-3
SUMMARY .....	1-3
ZINC TREATED STEEL PLATE REPAIR .....	1-4
TECHNICAL ILLUSTRATION .....	1-6
BODY REPAIR PROCEDURES .....	1-14

## 1. GENERAL INSTRUCTION

This publication is designed to help you the body repair technician with your specialized work. Vehicle bodywork has changed a great deal over the years. As vehicles have developed technically, vehicle bodywork has also had to meet new requirements with design, changes to reconcile apparently conflicting demands to name just a few examples:

- strength and safety ; low weight
- spaciousness ; good aerodynamics
- high quality ; low price

The durability and ease of repair of the bodywork also plays an important part.

Nowadays, the use of highly automated production equipment makes it possible to maintain the tightest tolerances and thus ensure a high level of quality.

When bodywork is damaged, the customer rightly expects it to be expertly repaired to the same quality standards.

At the same time, for his safety, the customer expects you to have comprehensive knowledge of materials, measuring and straightening methods, possible distortion, optimum corrosion prevention and much more besides.

This publication is designed to help you update your knowledge and give you an idea of what you require to rectify moderate or severe accident damage, for your own safety and for the satisfaction of your customers.

## 2. IMPORTANT SAFETY NOTICE

### 2-1. BEFORE BEGINNING WORK

- Disconnect the battery to reduce the possibility of fire caused by electrical shorts.
- Check for fuel leaks and repair as necessary.
- Remove the fuel tank and/or fuel lines if welding equipment is to be used near the fuel system.
- Before welding, sanding or cutting, protect carpets and seats with fire-proof covers.
- Follow standard safety practices when using toxic or flammable liquids.
- Use standard safety equipment when spraying paint, welding, cutting, sanding or grinding. Standard safety equipment includes.
- Respirator and filter masks: Designed to filter out toxic fumes, mist, dust or other airborne particles. Use a respirator or filter mask designed to protect you from the hazards of the particular job; some respirators, for example, are designed to filter out only dust and airborne particles, not toxic fumes.
- Safety goggles or glasses: Designed to protect your eyes from projectiles, dust particles or splashing liquid.
- Gloves: Rubber gloves protect against corrosive chemicals. Welding gloves protect against burns and abrasions caused by welding, sanding or grinding.
- Safety shoes: Non-slip soles protect against slipping. Metal toe inserts protect against falling objects.
- Ear plugs: Protect eardrums from harmful noise levels.

### 2-2. DURING WORK

- Do not smoke while working near the fuel system.
- Deposit gas or solvent-soaked shop towels in an approved container.
- Brake lining contains asbestos, which can cause cancer. Do not use an air hose to blow off brake assemblies: use only an approved vacuum cleaner, and wear an approved filter mask or respirator.
- Always attach a safety cable when using a hydraulic ram or a frame straightening table: do not stand in direct line with the chains used on such equipment.

### 3. BODY SAFETY

Modern stressed-skin bodies are designed so as to have a sturdy passenger cell protected by front and rear crumple zones.

- In an accident the crumple zones are designed to convert impact energy into deformation work.
- The shape, material and metal thickness must all be precisely matched.

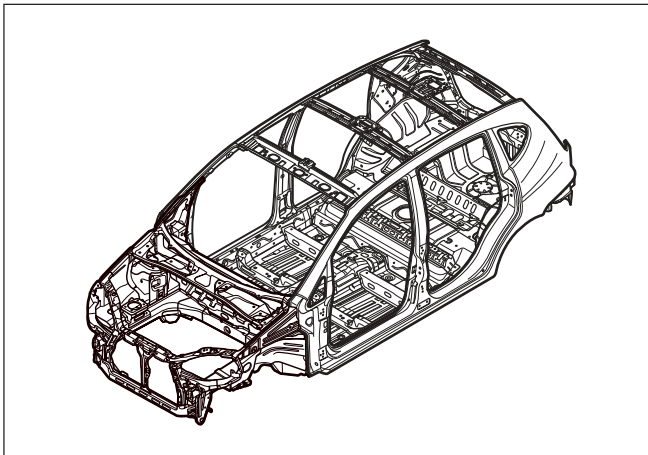


Fig. 1 Body Shell

- Many years of experience, refined computational methods and expensive series of crash tests mean that DAEWOO now builds bodies giving optimum deformation in the crumple zones in frontal or rear impacts.

When repairing body damage, it is therefore imperative to restore the original structure and strength in order to guarantee the safety of the occupants.

### 4. LOADS ON BODY PARTS

- The earlier practice of making a distinction between load bearing and non-loading bearing parts of vehicles with a chassis and body is no longer justified now. Every part, even the windows, contributes to the overall strength of the vehicle.

THEREFORE, WITH MODERN DAEWOO BODIES, ONE TALKS OF HIGHLY STRESSED AND LESS HIGHLY STRESSED PARTS.

### 5. USE OF NEW HIGH-QUALITY MATERIALS

- The requirement for reduced body weight has led to a reduction in the amount of steel used, e.g. through the use of thinner sheet steels.

This has been achieved with HIGH STRENGTH SHEET STEELS, in spite of the need to meet higher body strength requirements at the same time.

High strength steels have a tensile strength and a yield strength as much as 30% higher than conventional steel. These properties must not be destroyed when carrying out repairs, e.g. by using excessive heat.

### 6. CORROSION PROTECTION

- The durability of the bodywork, its associated long-term safety and retention of value largely depend on the corrosion protection given to the sheet metal. Here, DAEWOO takes a great deal of care in production.
- Therefore, this corrosion protection must be preserved or restored when repairs are carried out.

### 7. SUMMARY

- All DAEWOO vehicles are built to the highest standards in terms of styling and material properties.
- These high quality standards must be maintained when accident repairs are carried out.
- Mistakes made when carrying out repair operations such as straightening, welding sheet-metal parts, etc. not only produce visible defects, but may also compromise the safety of the vehicle.
- Mistakes made when restoring the corrosion protection compromise durability.

## 8. ZINC TREATED STEEL PLATE REPAIR

The zinc plated steel plate used in some panels of the LANOS requires different repair techniques than ordinary steel plate.

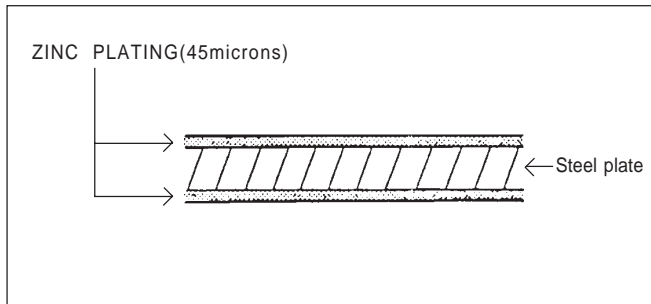


Fig. 2

1. Before spot welding the zinc plated steel plate, remove the paint from both sides of the flange to be welded. Apply sealer to the flange after welding.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting or grinding.

**NOTE:** Seal the sanded surfaces thoroughly to prevent rust.

2. The electric continuity properties of zinc plated steel plate is different from ordinary steel plate. When spot welding, increase the current by 10-20%, or increase the resistance welding time.

Increase the number of weld spots by 10-20% also.

**NOTE:** The MIG welding procedures for zinc plated steel plate are the same as for ordinary steel plate.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

3. Before applying putty or body filler to the zinc plated steel plate, sand the zinc plating thoroughly to promote adhesion and prevent blistering.

**NOTE:** Use only epoxy-based putties and fillers on zinc plated steel plate.



**BLANK**

9. TECHNICAL ILLUSTRATION

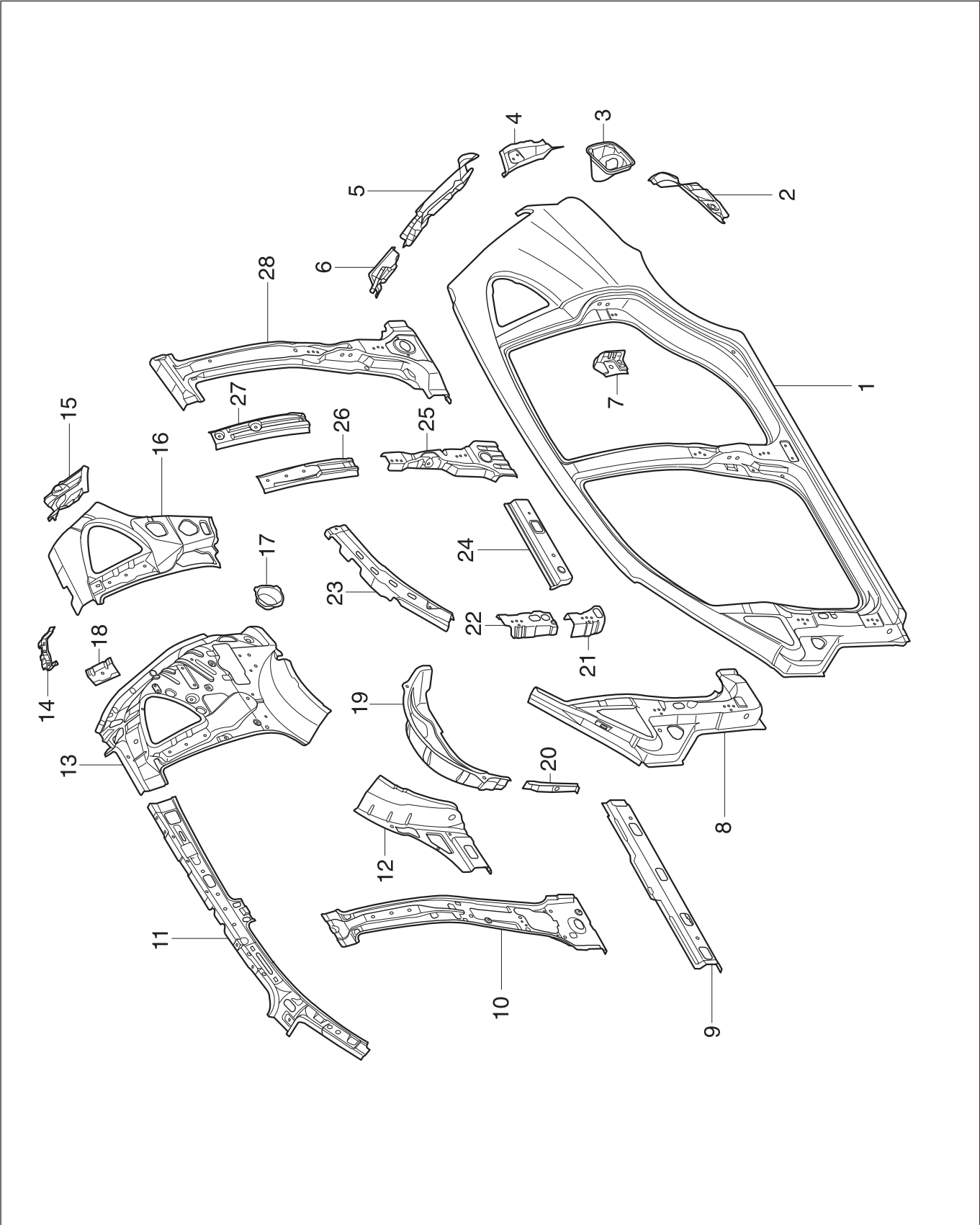


Fig. 3

- |                                     |                              |
|-------------------------------------|------------------------------|
| 1. Panel Side Outer                 | 15.Reinforce "D" Filler Rear |
| 2. Panel Side Lower                 | 16.Reinforce "C" Filler      |
| 3. Cap Fuel Filler                  | 17.Reinforce Retract Rear    |
| 4. Panel Tail Lamp Housing Lower    | 18.Rear Seat Belt Upper      |
| 5. Panel Tail Lamp Housing Center   | 19.Patch Wheel House Inner   |
| 6. Panel Tail Lamp Housing Upper    | 20.Patch Wheel House Inner   |
| 7. Door Striker                     | 21.Front Door Hinge          |
| 8. Front Filler Lower               | 22.Front Door Hinge Upper    |
| 9. Reinforce Rocker                 | 23.Front Filler Upper        |
| 10.Center Filler Inner              | 24.Rocker Front              |
| 11.Rail Roof Side                   | 25.Seat Belt Front           |
| 12.Extension Side Inner Front       | 26.Rear Door Hinge           |
| 13.Panel Side Inner Rear            | 27.Patch Center Filler       |
| 14.Bracket Trim Mounting Rear Upper | 28.Reinforce Center Filler   |

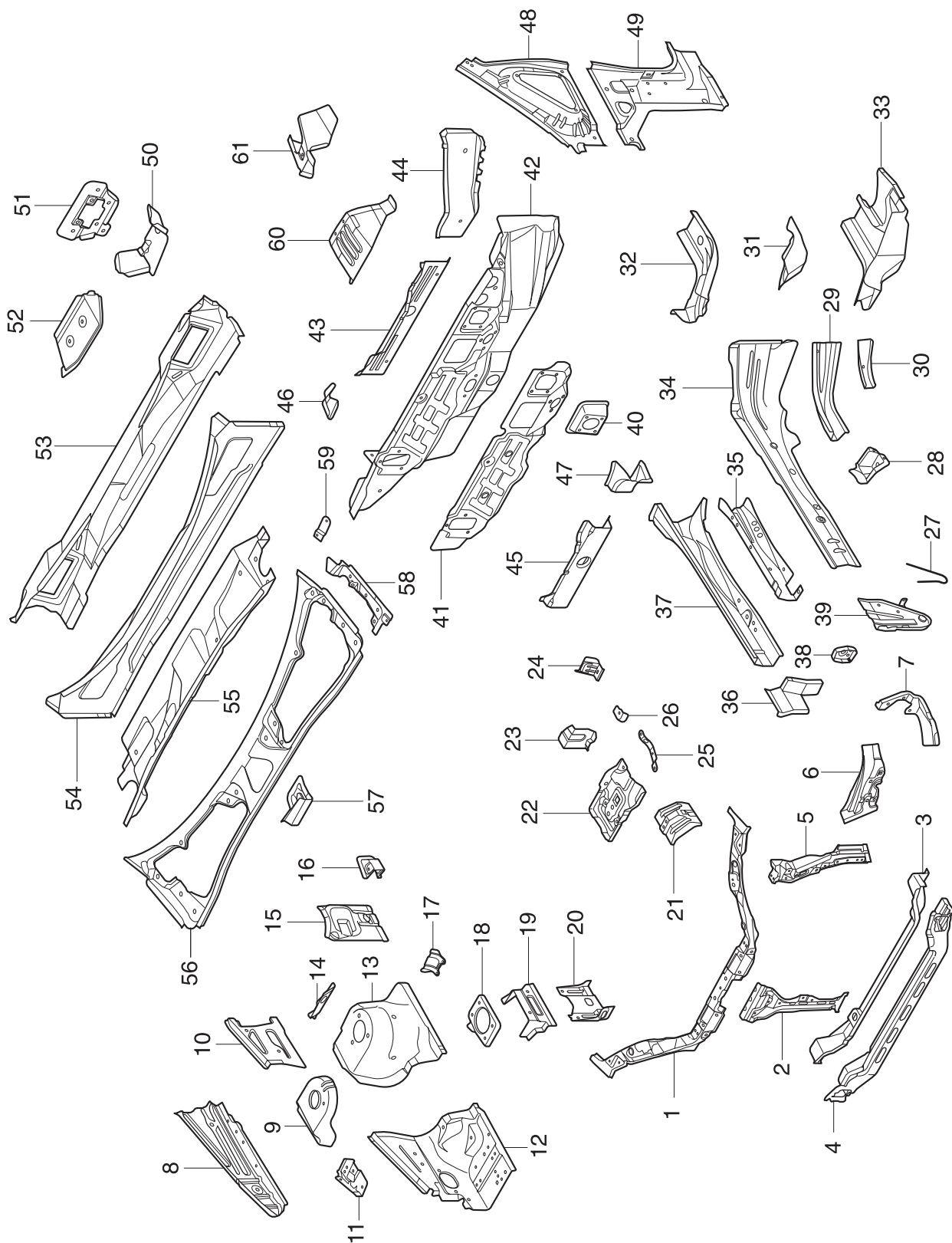


Fig. 4

1. Front Panel Upper
2. Support Front Panel Center
3. Crossmember Radiator Rear
4. Crossmember Radiator Front
5. Support Front Panel Side Inner
6. Support Front Panel Side Outer
7. Reinf Front Panel Side
8. Brace Wheel House
9. Rocator S/Absorber
10. Extension Wheel House Front
11. Bracket Fender
12. Wheel House Front
13. Wheel House Rear
14. Pannel Dash Upper Side
15. Stiffener Torque
16. Bracket Torque
17. Bracket Aircleaner
18. Bracket Engine Upper
19. Bracket Engine Rear
20. Bracket Power Steering Reserver
21. Support Tray Battery Inner
22. Tray Battery
23. Bracket Fuse Box Lower
24. Bracket Fuse Box Upper
25. Reinf Tray Battery
26. Bracket T/M
27. Bar Towing Front
28. Support Wheel Carrier Front
29. Reinf Front Longitudinal Outer Rear
30. Patch Reinf Longitudinal Outer
31. Reinf W/Carrier Rear
32. Extension Front Longitudinal
33. Brace Front Longitudinal
34. Longitudinal Front Inner
35. Reinf Front Longitudinal Inner
36. Support Crossmember Radiator Inner
37. Longitudinal Front Inner
38. Reinf Stay Front Bumper
39. Support Crossmember Radiator Outer
40. Cap Brake Booster
41. Panel Dash Lower Inner
42. Panel Dash Lower
43. Crossmember Dash Inner Lower Center
44. Crossmember Dash Inner Lower Side
45. Crossmember Dash Outer Lower Center
46. Reinf Wiper Motor
47. Crossmember Dash Outer Lower Side
48. Panel Front Filler Inner Center
49. Panel Front Filler Inner Lower
50. Bracket Steering Column Lower
51. Bracket Steering Column Rear
52. Bracket Steering Column Upper
53. Crossmember Dash Upper
54. Head Dash Upper
55. Panel Dash Upper
56. Panel Dash Top
57. Bracket Surgetank
58. Reinf Hinge Hood
59. Reinf Wiper Center
60. Patch Dash Lower Center
61. Reinf Tunnel Upper Front

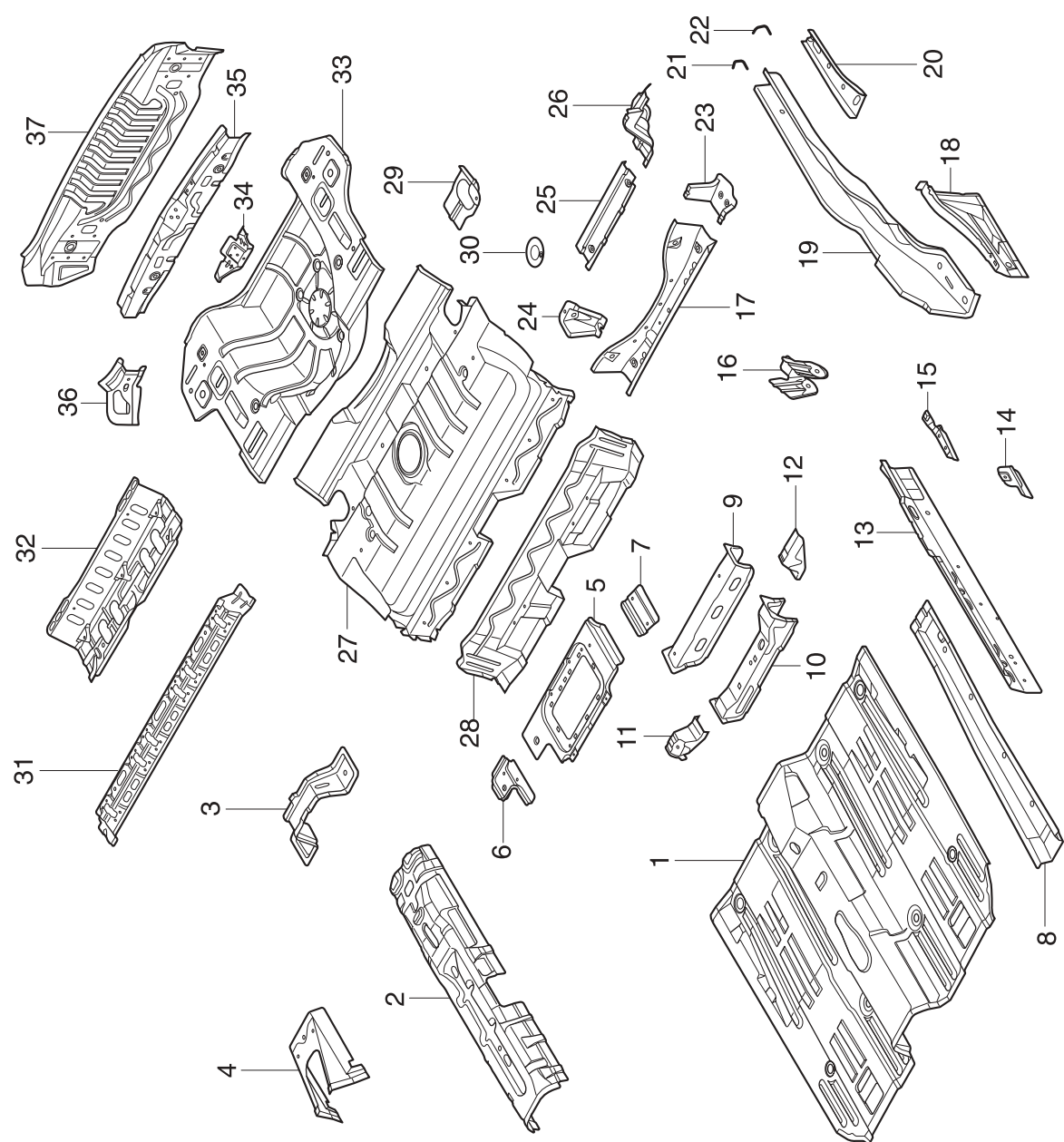


Fig. 5

- |                                  |                                       |
|----------------------------------|---------------------------------------|
| 1. Panel Front Floor             | 20.Reinf Rear Longitudinal Rear       |
| 2. Reinf Tunnel                  | 21.Hanger Extension Pipe Rear Inner   |
| 3. Tunnel Front                  | 22.Hanger Extension Pipe Rear Inner   |
| 4. Reinf Tunnel Upper Rear       | 23.Crossmember Rear Floor Center Side |
| 5. Panel Second Floor Rear       | 24.Reinf Rear Longitudinal            |
| 6. Reinf Second Floor Rear Inner | 25.Crossmember Rear Floor Rear        |
| 7. Reinf Second Floor Rear Outer | 26.Crossmember Rear Floor Rear Side   |
| 8. Longitudinal Floor Rear       | 27.Panel Rear Floor Rear Side         |
| 9. Crossmember Front Seat Rear   | 28.Crossmember Rear Floor Front       |
| 10.Crossmember Front Seat Front  | 29.Support Rear Seat Rear             |
| 11.Support Front Seat Inner      | 30.Seat Upper Spring                  |
| 12.Support Front Seat Outer      | 31.Crossmember Rear Seat Front        |
| 13.Tunnel Rear                   | 32.Crossmember Rear Seat Rear         |
| 14.Support Retracter             | 33.Panel Rear Floor Rear              |
| 15.Reinf Floor Side              | 34.Reinf Striker                      |
| 16.Bracket Rear Axle Outer       | 35.Reinf Back Panel Lower Center      |
| 17.Crossmember Rear Floor Center | 36.Reinf Back Panel Lower Side        |
| 18.Panel Floor Side Rear         | 37.Panel Back Lower                   |
| 19.Longitudinal Rear             |                                       |

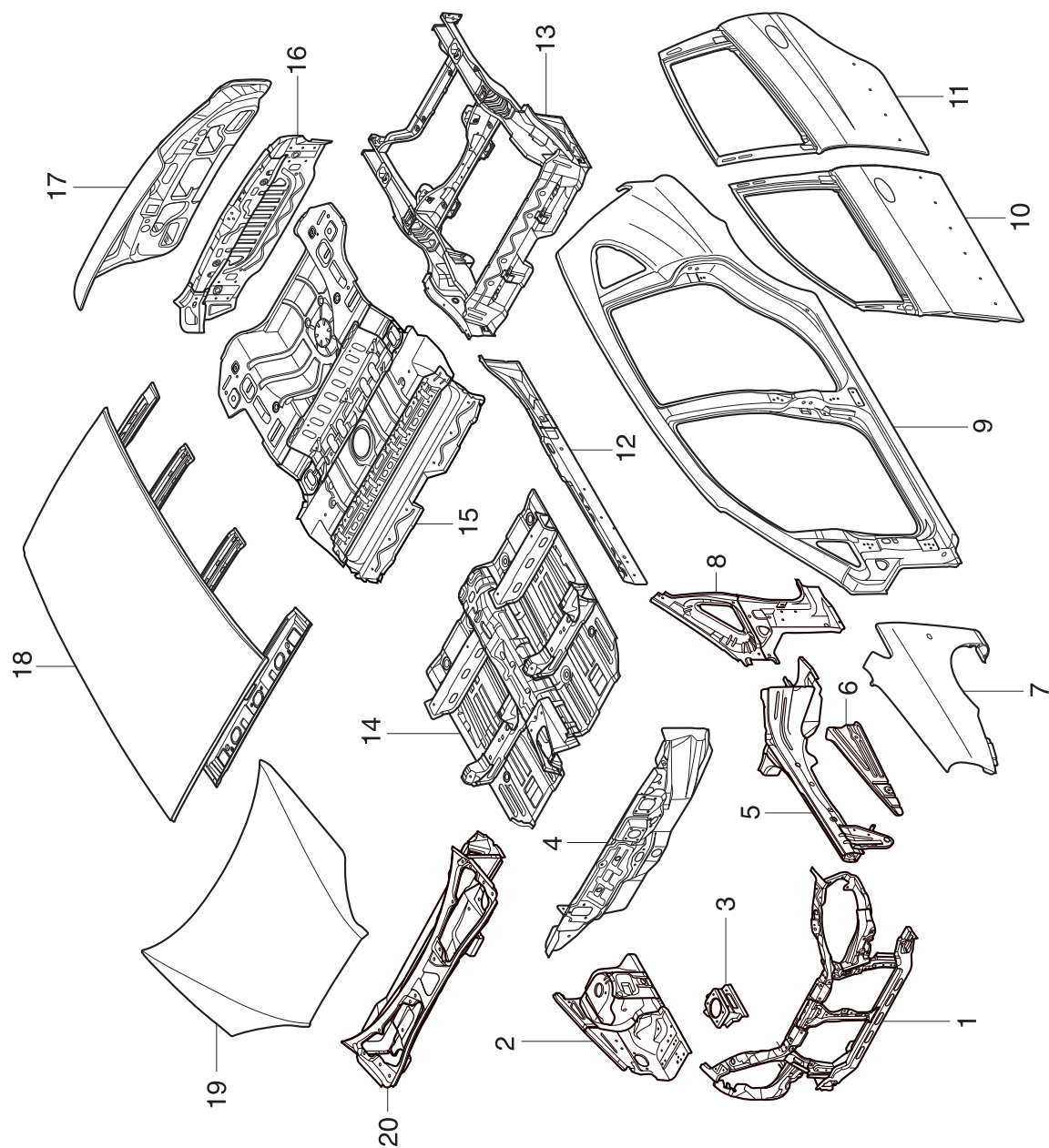


Fig. 6



- |                             |                      |
|-----------------------------|----------------------|
| 1. Front Panel              | 11. Rear Door        |
| 2. Front Wheel House        | 12. Floor Panel Side |
| 3. Bracket Engine           | 13. Rear Frame       |
| 4. Dash Panel Lower         | 14. Front Floor      |
| 5. Front Longitudinal       | 15. Rear Floor       |
| 6. Brace Wheel House        | 16. Back Panel Lower |
| 7. Fender                   | 17. Tail Gate        |
| 8. Reinf Front Filler Lower | 18. Roof             |
| 9. Side Body                | 19. Engine Hood      |
| 10. Front Door              | 20. Dash Panel Upper |

## 10. BODY REPAIR PROCEDURES

No.	Operation	Procedure	Remarks
1	Inspection	Inspect the damaged parts and the extent of damage and make plans for the repair.	
2	Preparation	Prepare the new parts, special repair tools and others.	
3	Removal	Remove the related parts for repair.	
4	Pull out	Roughly pull out and straighten the damaged areas.	
5	Cut and pry off	Cut off the damaged areas and drills on the spot weld nuggets and pry off the remaining spot weld flanges.	
6	Peel off	Peel off the undercoat and sealer.	
7	Molding	Mold damaged areas and even out the welding flanges and fill any holes.	
8	Set the new parts	Grind both sides of the welding section and set the new parts and tack welds for temporary installation.	
9	Inspection	Inspect the dimensions for correct position and preinstall the exterior parts and check the clearances and level differences.	
10	Welding	Perform a trial welding and the main welding.	
11	Finish	Finish the welding areas and even out the flanges for a close fit.	
12	Sealing	Apply the sealer to the matching and over lapped surface.	
13	Undercoating	Apply the undercoat to the required areas.	
14	Painting	Apply the paint.	
15	Deadner	Apply the deadner to the designated areas.	
16	Anti-rust agents	Coating the anti-rust agents to the designated areas.	
17	Installation	Install the related parts and rub in grease to the moving parts and replenish the cooling liquid, oil, aircon gas and others.	
18	Check and adjust	Check all operations, wheel alignments, leaks, head lamp aim and others with the specified check sheet.	

## **SECTION 2**

# **PREPARATIONS OF BODYWORK**

### **CONTENTS**

<b>GENERAL DESCRIPTION .....</b>	<b>2-2</b>
<b>CHECKPOINTS .....</b>	<b>2-3</b>
<b>CORRECTION OF THE DAMAGED AREA .....</b>	<b>2-4</b>
<b>MEASURING SYSTEMS (WITHOUT SMALL DAMAGE).....</b>	<b>2-5</b>

1. GENERAL DESCRIPTION

- Most monocoque bodies are composed as a single unit by welding together pressed parts made of steel plates which come in a variety of different shapes and sizes. Each part is responsible for displaying a certain strength and durability in order that it may play its role in meeting the functions of the body as a whole.

Damage to the exterior of the body can be inspected visually, but where there has been an external impact, it is necessary to inspect the extent of the damage. In some cases, the deformation has spread beyond the actual areas which were in the collision and so this has to be inspected closely.

Unit: mm

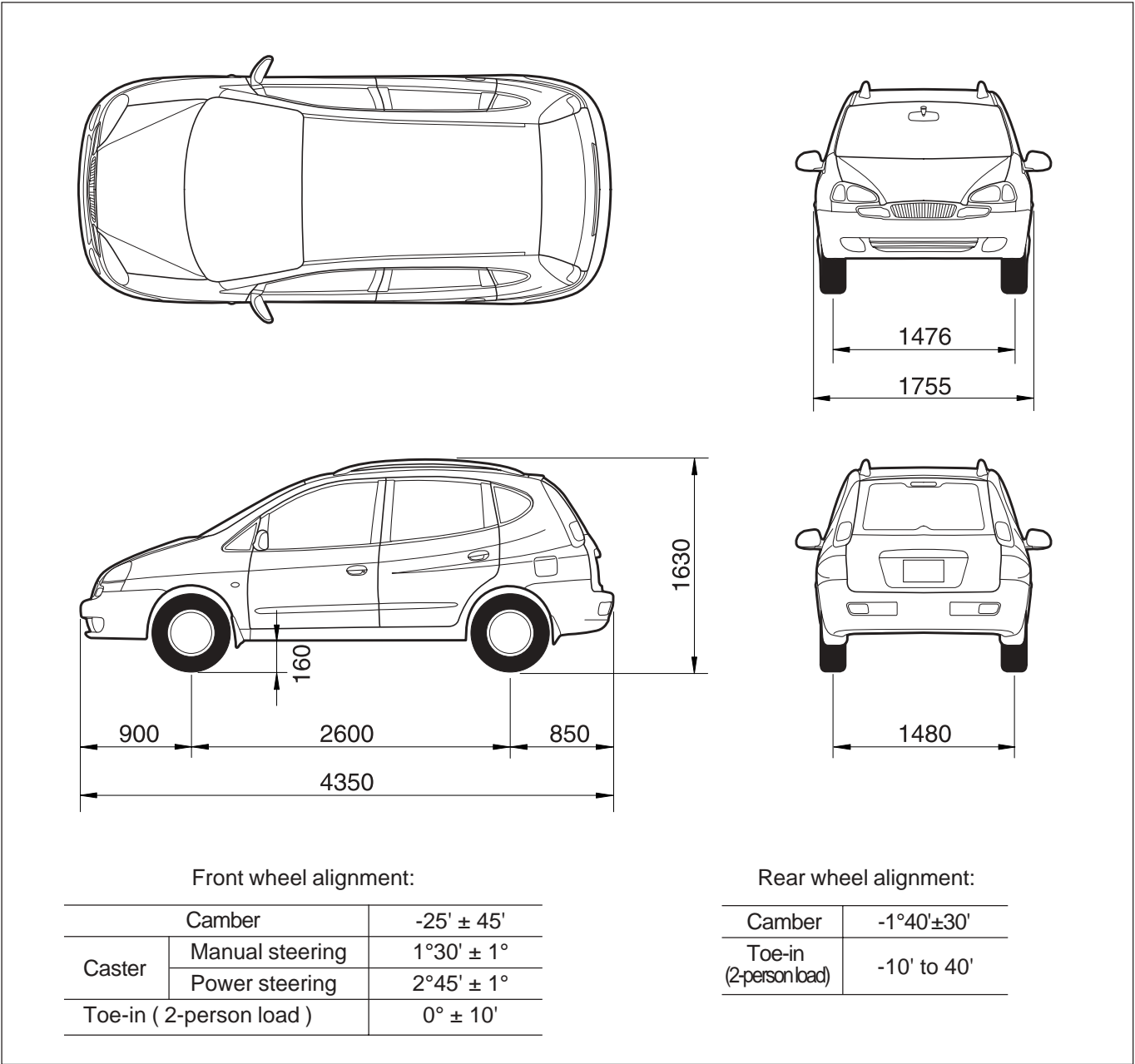


Fig. 1

## 2. CHECKPOINTS

- Accurate Inspection of Damaged Parts(Visual)

### Seat Belts

Always replace the seat belt if:

1. The belt material is cut, punctured, burned or in any way damaged.
2. The buckle or retractor does not work properly.
3. They were being worn at the time of a collision(also check for damage at the seat belt anchor points).
4. Their condition is questionable.

### Front Section:

1. Is there any bending, splitting, denting or other damage to the suspension and its related parts?
2. Is there any deformation of the front panel or radiator crossmember? Have any of the connected sections come apart?
3. Are there any creases or distortion in the front wheel-house or side frame? Have any of the connected sections come apart?
4. Is there any bending or twisting of the whole front area?
5. Is there any deformation like creases, bulges, or dents in the front pillar, dash panel, floor, etc.?
6. Is there any vertical twisting or misaligned clearance in the door?
7. Is the windshield seal broken?
8. Is there any deformation in the vicinity of the top part of the roof panel's center pillar?
9. Is there any damage inside the automobile(is there any twisting of the dash panel, or anything irregular with the clearances or sheet-mounting parts)?
10. Is there any damage to the steering wheel? Is there any deformation in the column and the column-mounted parts?
11. Is there any oil or water leakage and damage to the engine, transmission or brakes?
12. Is there any irregular noise in the gear changing operation, engine and transmission rotation?
13. Are there any traces of contact between the engine block and the center crossmember?
14. Is there any damage to brake or fuel lines, or wire harnesses?

### Rear Section:

1. Is there any twisting, bulging or denting of the rear floor any rear bolsters? Have any of the connected sections come apart?
2. Is there any irregular bulging or denting in the rear fender?
3. Is there any distortion in the rear inner panel? Is there any bending and denting in the vicinity of the rear pillar?
4. Is there any distortion or creasing in the rear wheel-house and arch sections? Have any of the connected sections come apart?
5. Is there anything irregular in the rear glass seal clearance?
6. Is there any twisting or misalignment of the clearance of the trunk lid opening section?
7. Is there any bending, splitting, denting or other damage to the suspension and its related parts?
8. Is there any deformation of the rear floor crossmember, trunk floor panel and back panel? Have any of the connected sections come apart?

### Impact Beam :

Always replace the door assembly if:

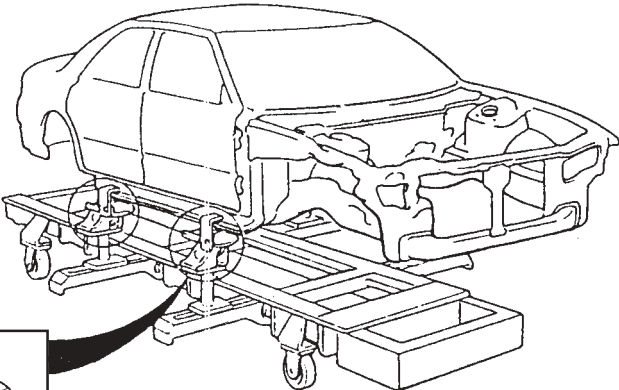
1. The external force makes the impact beam of door inner deform.

Always replace impact beam if:

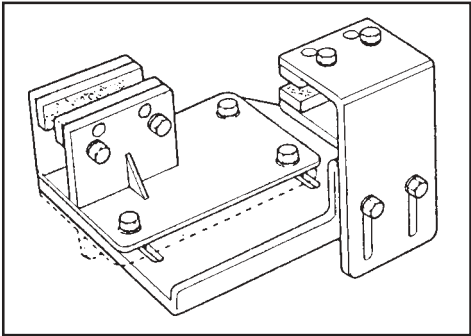
2. The external force makes the impact beam of front bumper and rear bumper deform.

3. CORRECTION OF THE DAMAGED AREA

- Set the frame corrector on the car body.
- The side frame is to allow reshaping by pulling it out.
- Use the horizontal pinch welds for anchoring the car.

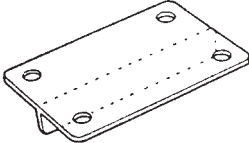


UNDERBODY CLAMPS

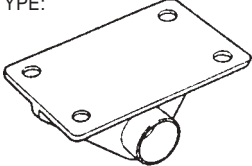


- Apply load to the damaged section and pull it out until the section is almost restored to the original shape.

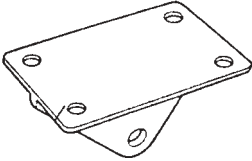
STANDARD TYPE:



C-TYPE:



U-TYPE:



	Standard type	C-type	U-type
Frame correctors	<ul style="list-style-type: none"><li>• Dataliner</li><li>• Car-o-liner</li><li>• Celette</li><li>• Flex-o-liner</li><li>• etc.</li></ul>	<ul style="list-style-type: none"><li>• Korek</li><li>• Auto pole</li><li>• etc.</li></ul>	<ul style="list-style-type: none"><li>• U-Base</li><li>• Pro-Tec</li><li>• etc.</li></ul>

Fig. 2

## 4. MEASURING SYSTEMS (WITHOUT SMALL DAMAGE)

- Whenever possible, make judgements and conclusions based on measurement. Measure the wheel alignment(see pages 2-2, 2-3) so as to prevent any future trouble like unsymmetrical wear of the tires or catching of the steering wheel.
- If there are any deviations, use a tram tracking gauge and measure parts of the body.(Below Fig. 4-1)
- If there is any twisting to the body, measure using a frame centering gauge.(Below Fig. 4-2)
- When measuring body dimensions, use a universal tram gauge.(Below Fig. 4-3)

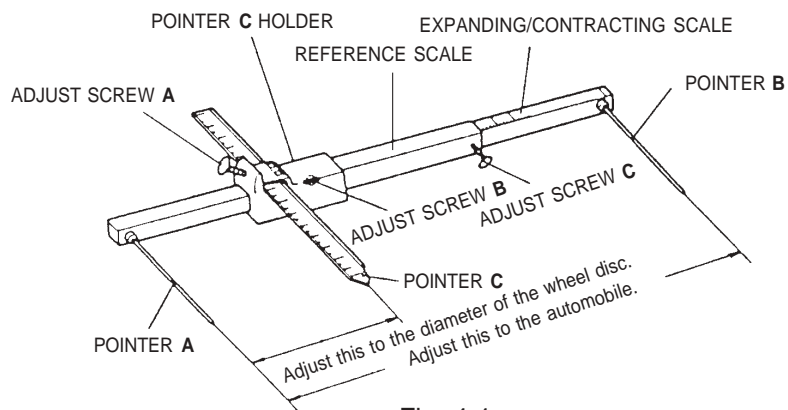


Fig. 4-1

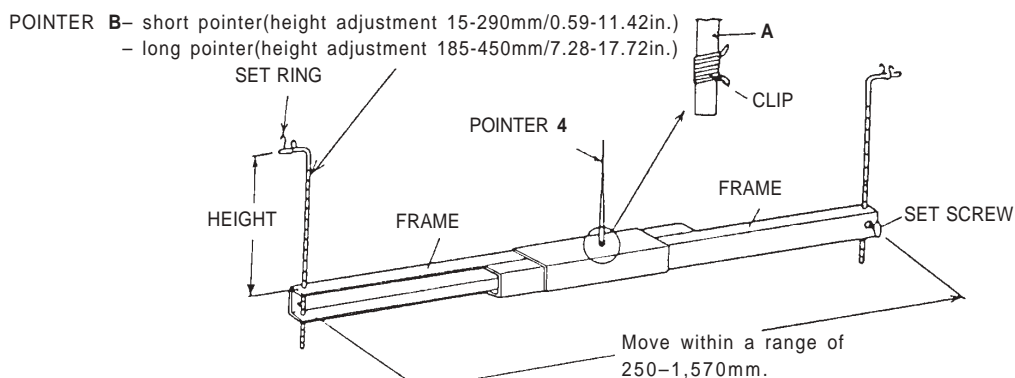


Fig. 4-2



Fig. 4-3

Fig. 3

## SECTION 3

# WELDING AND TOOLS

### CONTENTS

<b>SPOT WELDING .....</b>	<b>3-2</b>
• General description .....	3-2
• Welding conditions .....	3-2
• Welding strength test .....	3-3
<b>GAS WELDING .....</b>	<b>3-4</b>
<b>CARBON DIOXIDE ARC WELDER .....</b>	<b>3-5</b>
<b>(MIG ARC WELDING)</b>	
<b>REPAIR TOOLS.....</b>	<b>3-6</b>



## 1. SPOT WELDING

### 1-1. GENERAL DESCRIPTION

Spot welding is also known as resistance spot welding and it is the most suitable method of welding for automobiles. It has three main features: the welding can be performed instantaneously, it exercises very little effect on the mother material, and it reduces the generation of distortion to the absolute minimum. However, please remember to remove all paint and other impurities from the surface of the material you intend to weld for reliable results.

### 1-2. WELDING CONDITIONS

When performing spot welding, make absolutely sure that you conform to the conditions governed by the current, conductivity time, welding pressure, holding time, and shutdown time recommended for the spot welder.

Please bear in mind the following points when welding:

- Plate thickness and minimum welding pitch

**NOTE:** When the welding intervals are too small, this leads to branching, making it impossible to maintain the desired soldering state.

(Unit : mm)

Plate thickness	0.6	0.9	1.2	1.6
Minimum intervals	11	16	20	24

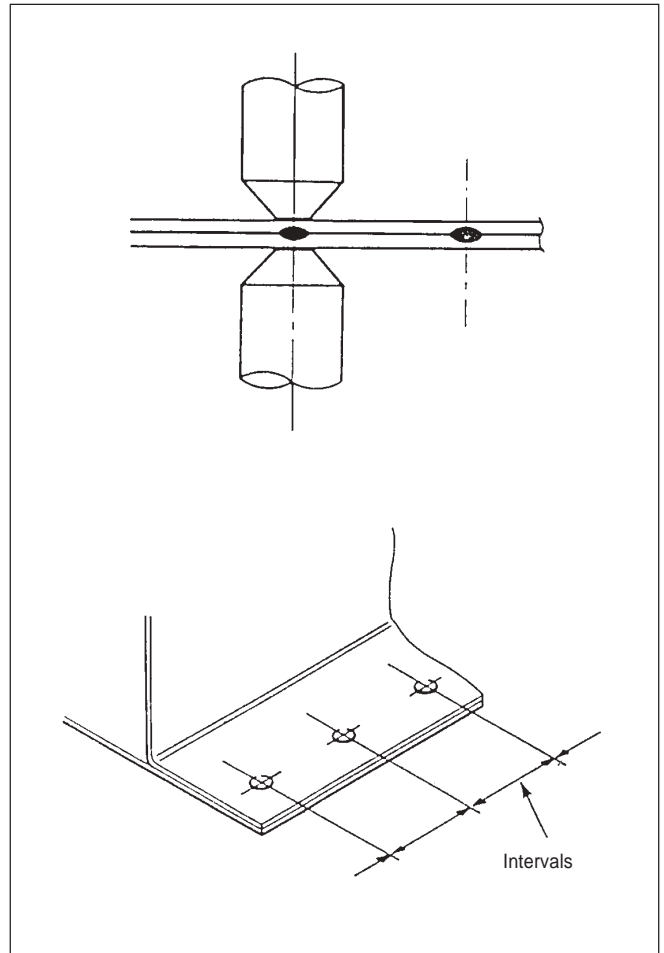


Fig. 2

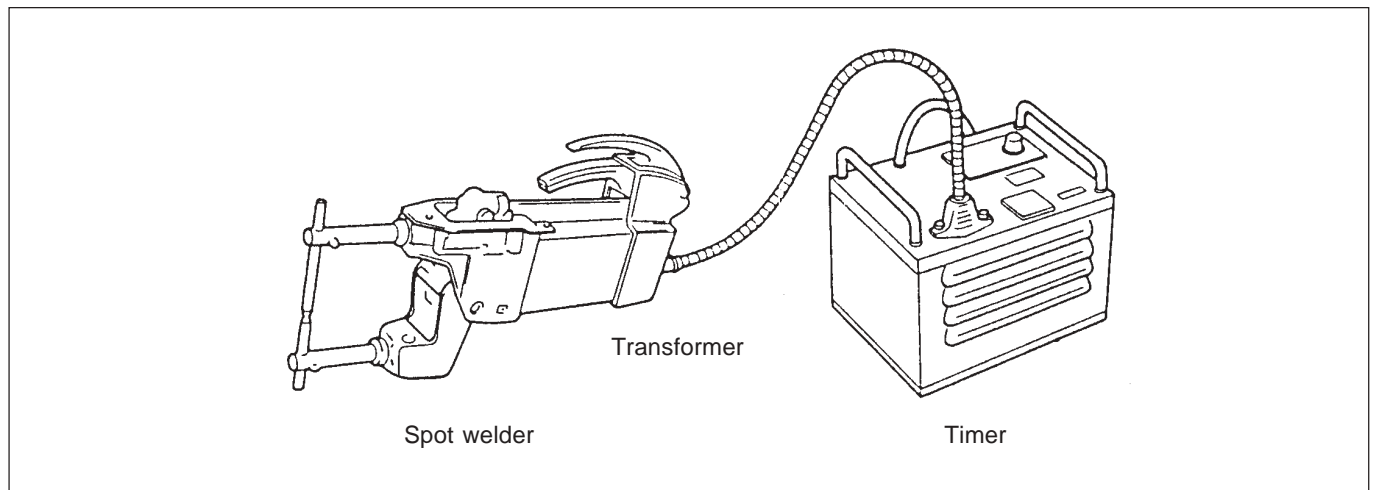


Fig. 1 Welders

- Plate thickness and tip diameter

(Unit : mm)

Plate thickness	0.6	0.9	1.2	1.6
Tip diameter	ø4.5	ø5.0	ø5.5	ø6.0

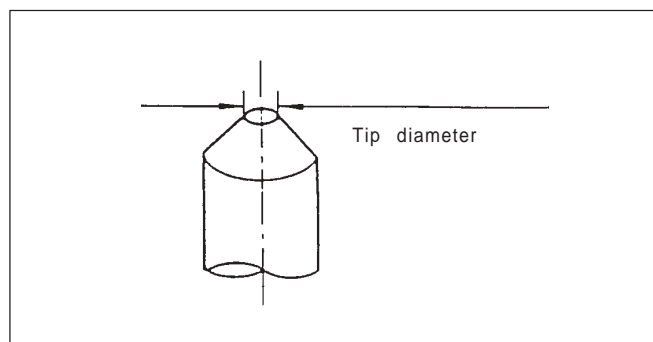


Fig. 3

### 1-3. WELDING STRENGTH TEST

Even if you perform the welding in accordance with the conditions, the strength of the welded sections may fluctuate widely with drops in the voltage and other factors. The quality of the welding cannot be evaluated unless the welded sections are destroyed.

Provide yourself with a steel plate of the same thickness and conduct a destruction test.

- If holes appear in the steel plates, this means that the welding is standard strength.
- Drive a wedge between two panels near the nugget. If the welded parts do not come apart and the diameter of the nugget appears more than 3 mm, the welding should be satisfactory.

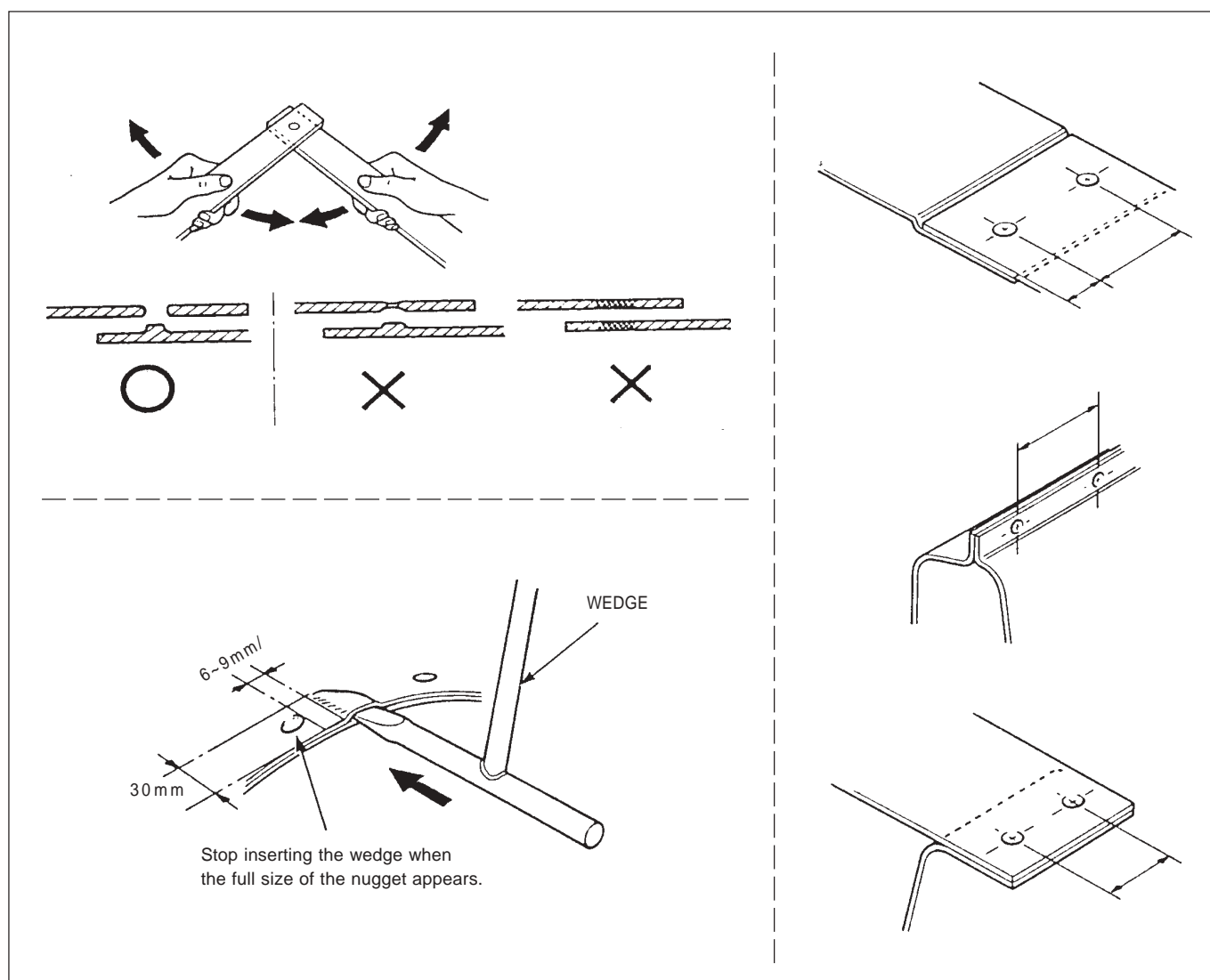


Fig. 4

**NOTE:**

It is difficult to perform spot welding in the following circumstances.

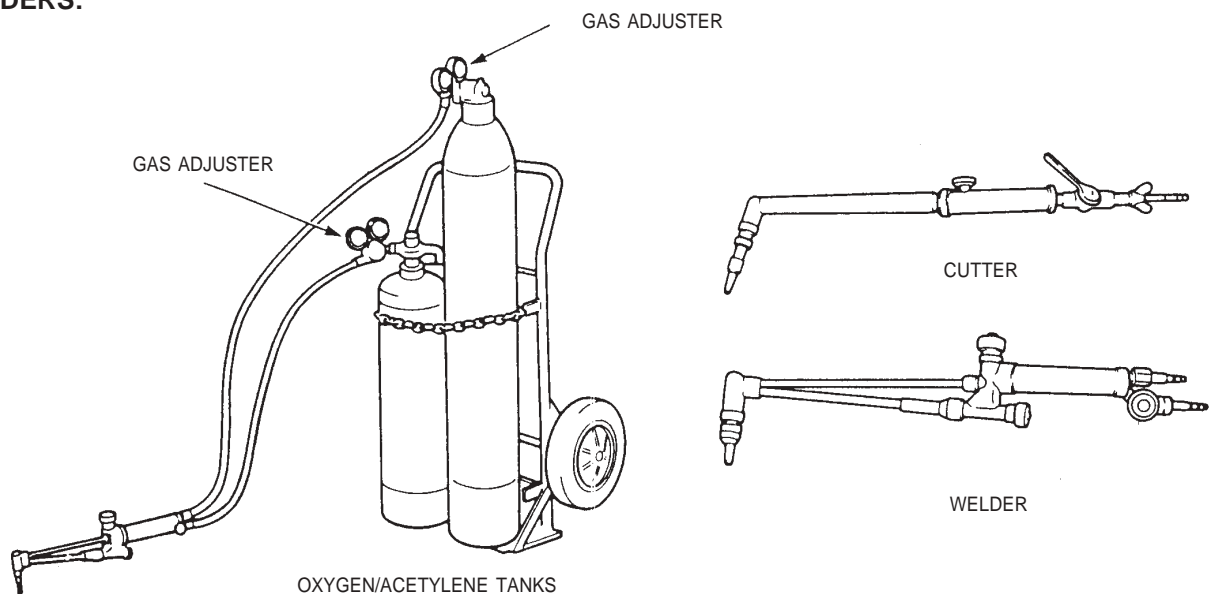
- When it is not possible to remove any rust or paint attached to the welding surfaces.
- When the tip of the spot welder cannot be inserted into the welding section.
- When the welding surfaces can be seen from the outside and welding will impair the exterior appearance.

In all these cases, it is recommended that the gas welding method be employed. However, if it is not possible to perform spot welding because of space restrictions, plug welding based on the arc welding method may be performed instead. Here the welding sections must be close together.

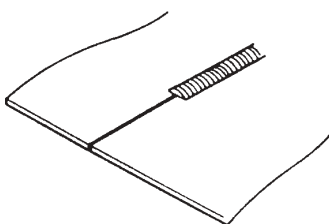
**2. GAS WELDING**

Gas welding is indispensable for body repair because of the broad range of its applications from joining the body panels, cutting the materials that construct the body and applying heat to reform panels, and also because it is easy to get hold of the tools.

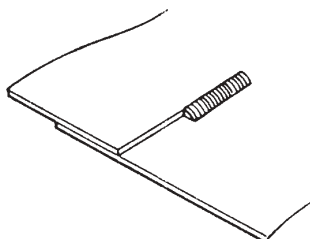
However, this method requires experience.

**WELDERS:****WELDING METHODS:**

BUTT WELDING



FILLET WELDING OR SOLDERING



DRILLING AND PLUG WELDING

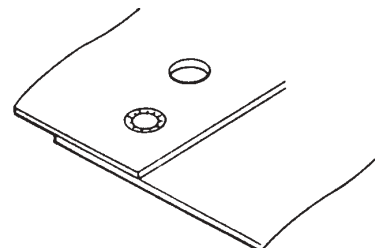


Fig. 5

**NOTE:** Below is an example of how not to perform gas welding, avoid operations like this.

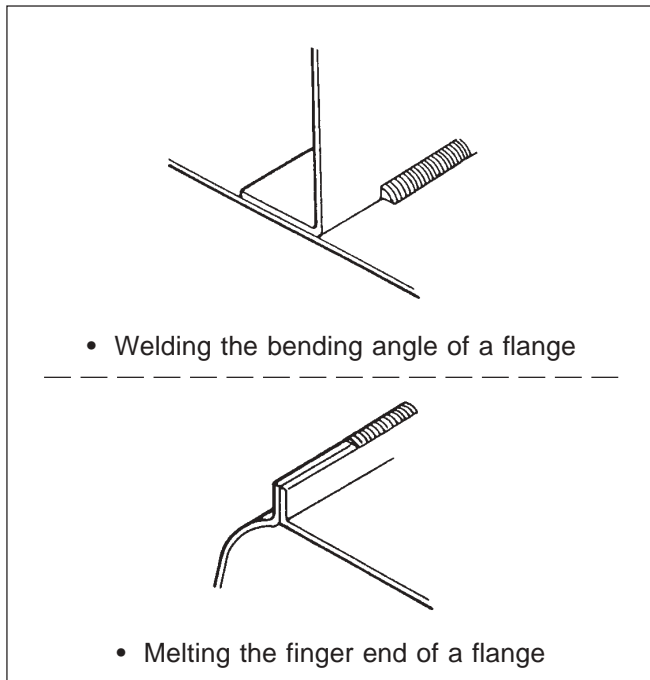
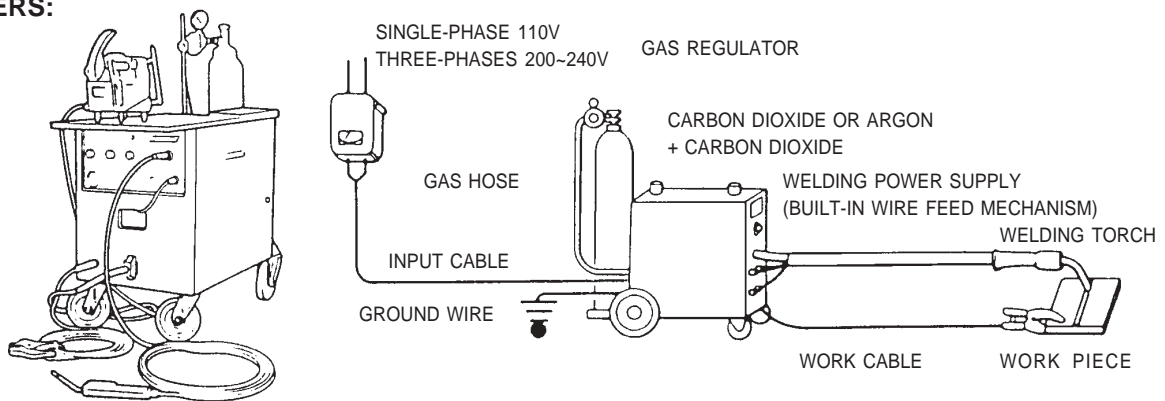


Fig. 6

### 3. CARBON DIOXIDE ARC WELDER(MIG ARC WELDING)

This welding process uses inexpensive carbon dioxide instead of expensive inert gases as a shielding means. Consumable metal electrodes are employed. It has a wide range of applications, including butt welding of thin plate, fillet welding, plug welding, and MIG spot welding. In terms of the weld strength, it is also highly stable.

#### WELDERS:



#### WELDING METHODS:

BUTT WELD

FILLET WELD

SPOT WELD

PLUG WELD

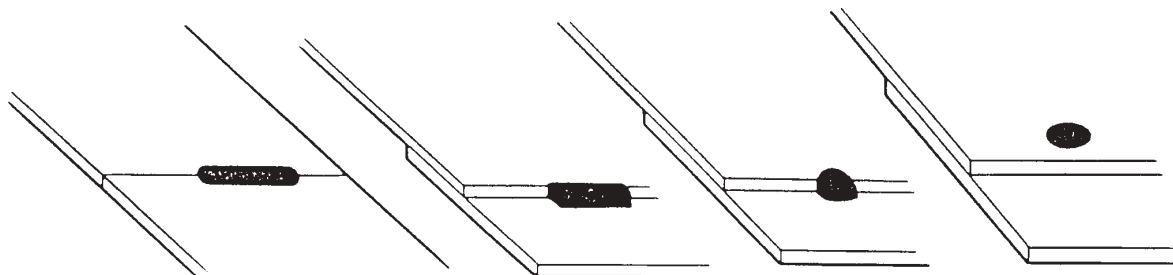




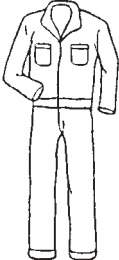






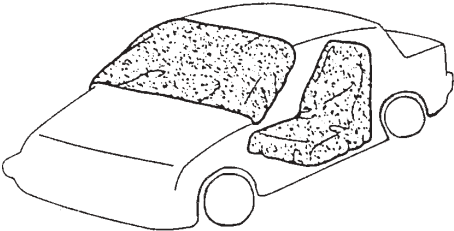


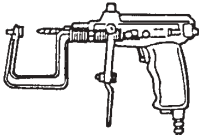
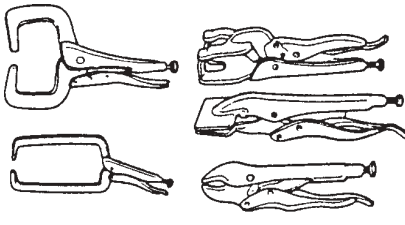
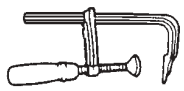

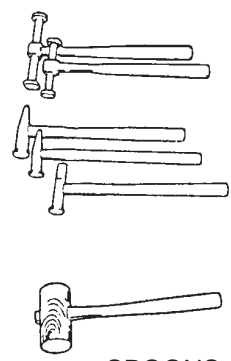
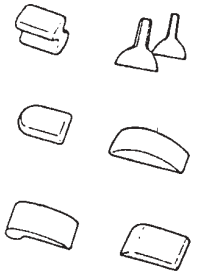
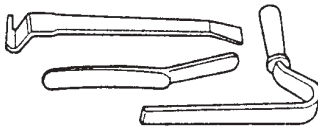



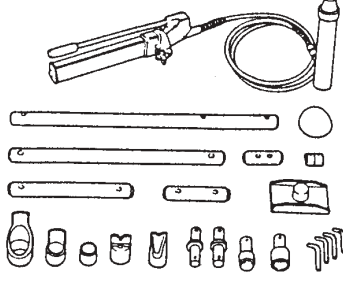
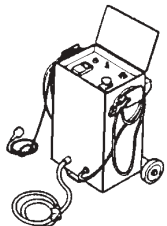
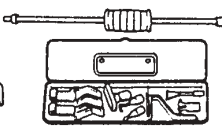
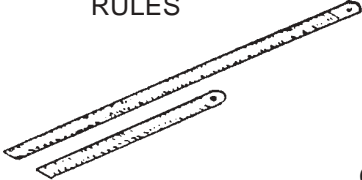

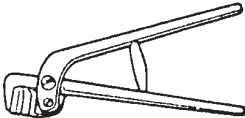
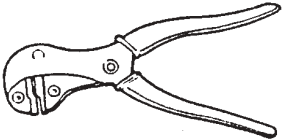

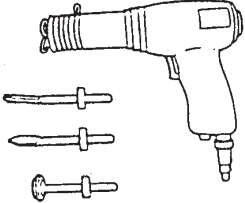

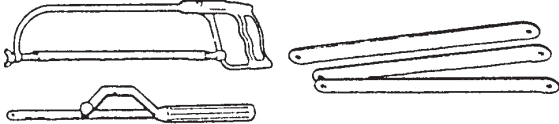

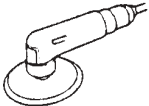
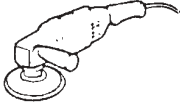
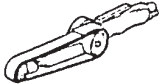


Fig. 7

4. REPAIR TOOLS

Item	Work	Tools. equipment used
Protective tools	Operator	<div><div><div>1. Protective goggles</div><div>2. Cap</div><div>3. Ear plug</div><div>4. Shield for eyes</div><div>5. Overalls with long sleeves</div><div>6. Dust-proof mask</div></div><div><div>7. Protective apron</div><div>8. Welding gloves</div><div>9. Foot protectors</div><div>10.Safety shoes</div><div>11.Work gloves</div><div>12.Spattering guard</div></div><div><div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div><div>9</div><div>10</div><div>11</div></div></div></div>
	Vehicle body	<div><div>12</div><div>Heat-resistant protective cover</div><div></div></div>
Processing tools	Plug hole drilling	<div><div>DRILLING BLADE, DRILL, SPOT CUTTER</div><div></div><div><div>PUNCH</div><div></div></div><div><div>PRESSURE DRILL</div><div></div></div></div>

Item	Work	Tools. equipment used
Fixing tools	Base metal fixing	<p>VICE GRIPS</p>  <p>SCREW CLAMP</p>  <p>SQUILL VISE</p> 
Shaping tools	Skin panel shaping	<p>HAMMERS</p>  <p>DOLLIES</p>  <p>SPOONS</p>  <p>FILE/FILE HOLDER</p>  <p>SNIPS/SHEARS</p>  
	Body, frame shaping	<p>BODY JACK</p>  <p>WELDER</p>  <p>SLIDER HAMMER</p> 

Item	Work	Tools. equipment used
Measuring tools	Measuring	<div><p>RULES</p><p>CONVEX RULES</p></div>
Flange tools	Edge preparation	 
Cutting tools		<div><p>AIR JIGSAW</p><p>AIR IMPACT CUTTER</p><p>HAND NIBBLER</p><p>HANDSAW</p><p>CHISEL</p></div>
Sanding tools	Cleaning	<div><p>DISC SANDER</p><p>Air type:</p><p>Electric type:</p><p>BELT SANDER</p></div>

## SECTION 4

# FRONT

### CONTENTS

<b>1. FRONT PANEL .....</b>	<b>4-2</b>
• General description .....	4-2
• Repair procedure .....	4-3
<b>2. FRONT WHEELHOUSE .....</b>	<b>4-6</b>
• General description .....	4-6
• Repair procedure .....	4-7
<b>3. FRONT LONGITUDINAL .....</b>	<b>4-11</b>
• General description .....	4-11
• Repair procedure .....	4-11
<b>4. SUPPORT CONTROL ARM .....</b>	<b>4-14</b>
• General description .....	4-14
• Repair procedure .....	4-15
<b>5. FRONT PILLAR .....</b>	<b>4-18</b>
• General description .....	4-18
• Repair procedure .....	4-20



## 1. FRONT PANEL

### 1-1. GENERAL DESCRIPTION

The front panel is joined to the front wheelhouse and front longitudinal. It forms the base for the headlamps and other parts and maintains the rigidity of the front section of the body. Pay particular attention to twists and parallelism and check mounting of related parts when welding.

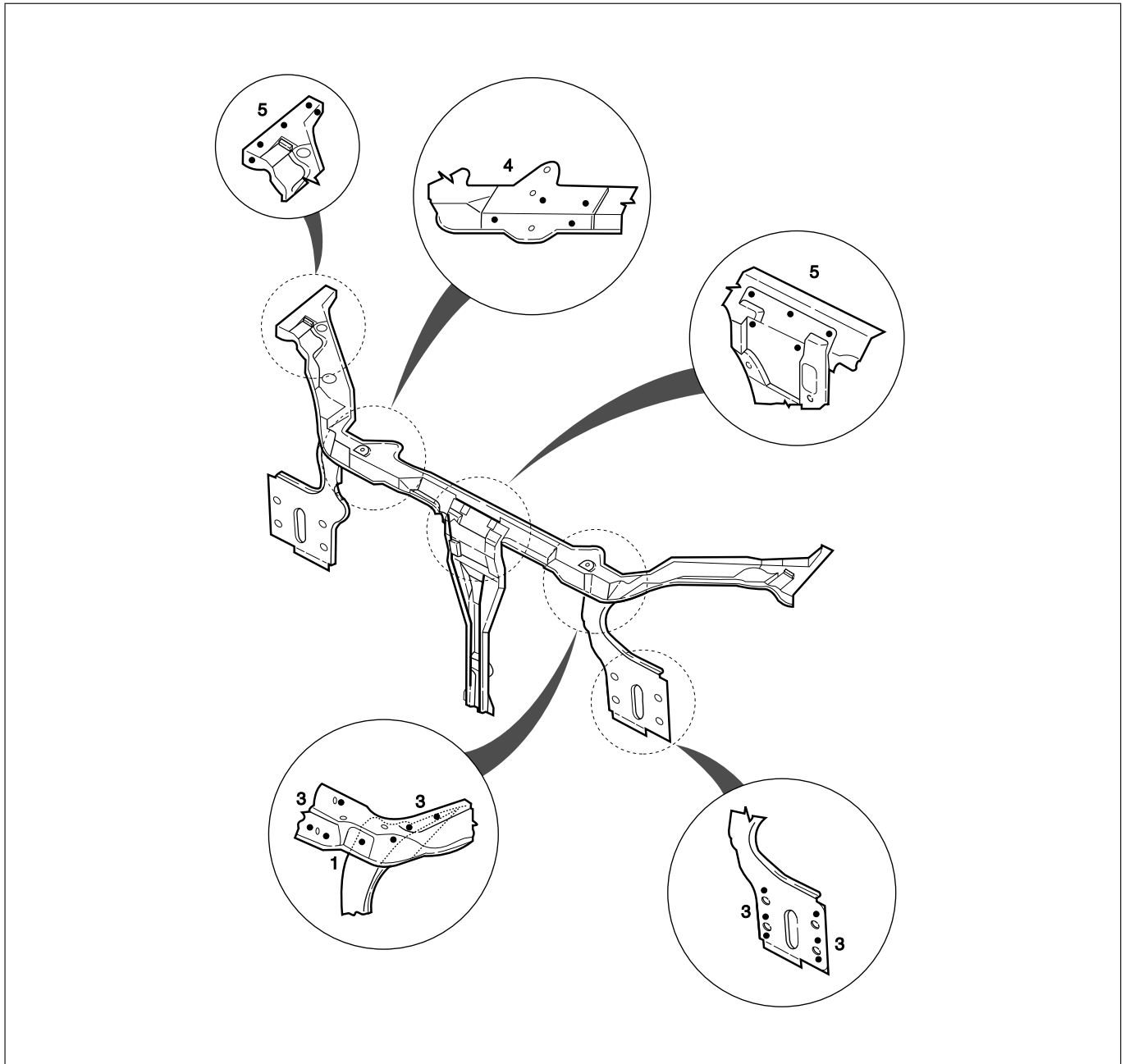


Fig. 1 Front Welding Assembly

## 1-2. REPAIR PROCEDURE

### 1. Remove the related parts.

- Hood, radiator grill and front bumper.
- Head lamps and fender.
- Engine, radiator and related parts.
- Aircon condenser and related parts.
- Others.

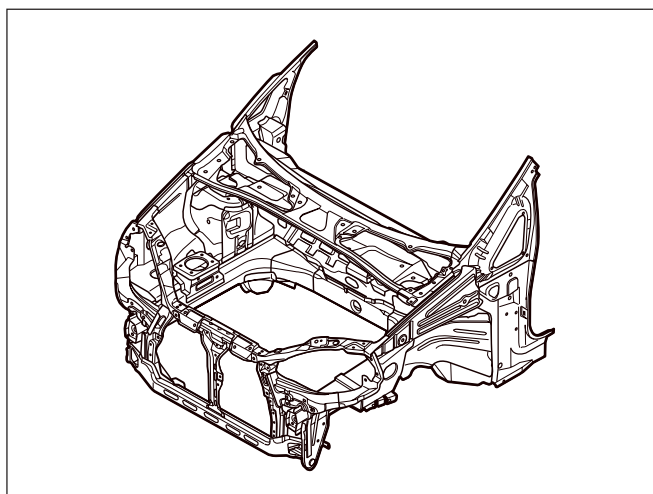


Fig. 2

### 2. Roughly pull out and straighten the damaged area.

- Check the damage to the front wheelhouse and front longitudinal before removing the front panel. Use the frame straightener to roughly pull out and repair the damaged front panel before removing the front panel.

**NOTE:** Check the fit of the door, taking care not to pull the damaged area out more than necessary.

- Use the horizontal pinch weld clamps and attach the car to the frame straightener at the clamping points securely.

### 3. Keep the body, level.

- Jack up the body, and place safety stands at the four designated places of the frame door opening.

### 4. Cut and pry off the front panel.

- Center punch around the spot weld imprints.
- Use the special spot cutter to drill holes at the spot weld nuggets on the front wheel house and longitudinal.

**NOTE:** When drilling holes be careful not to drill down to the front wheelhouse and longitudinal themselves.

- Cut off the front panel with an air chisel, leaving the welding flanges intact.
- Level and finish the burrs from the pried off spot welds with disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

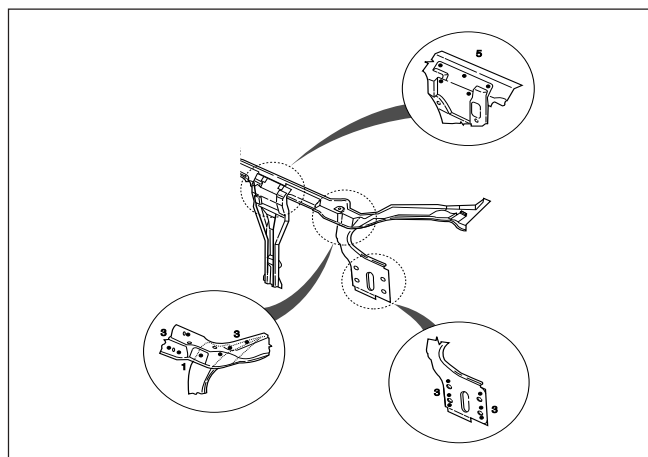


Fig. 3

### 5. Mold damaged related parts.

- Use a hammer and dolly to mold damaged areas of the front wheelhouse and longitudinal.
- Even out the welding flanges with a hammer and dolly.
- Fill any holes drilled by welding.

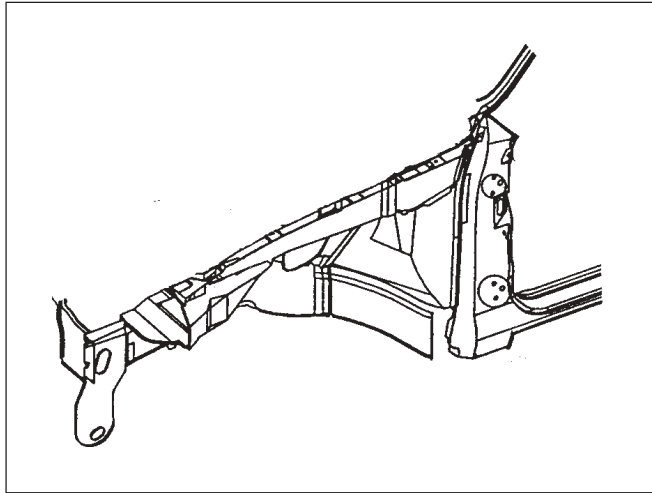


Fig. 4

6. Set the front panel.

- Grind both sides of the welding section of the front panel with a sander to remove the paint and expose the steel plate.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Clamp both the right and left sides with the vise grips as shown.
- Weld the clamped sections for temporary installation.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

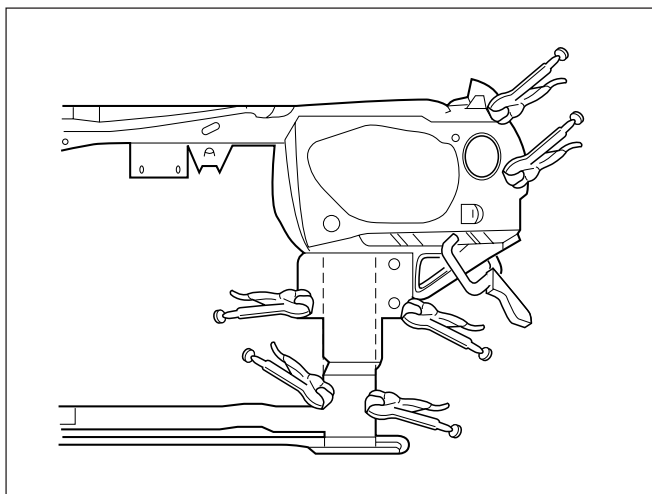


Fig. 5

**NOTE:** Make sure that the right and left front panels are in line with each others.

7. Measure the front compartment diagonally.

- Measure the front compartment diagonally with a tracking gauge or convex rule as shown to check it for twisting or bending.
- Temporarily assemble the fender, head lamps and hood, then check the clearances and level differences.

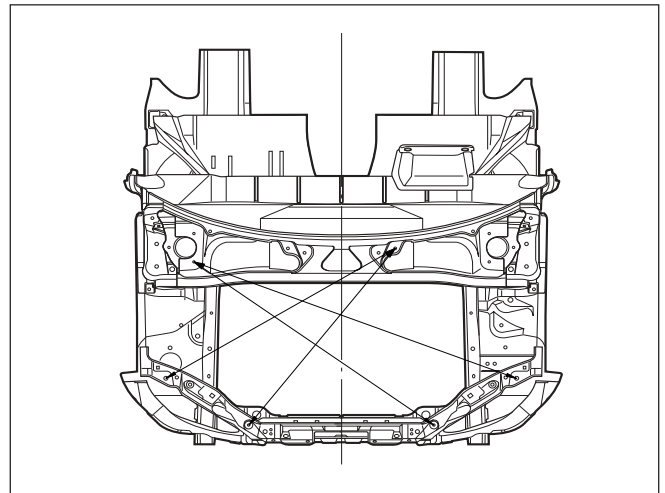


Fig. 6

8. Perform the main welding.

- Spot weld the front panel as shown.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

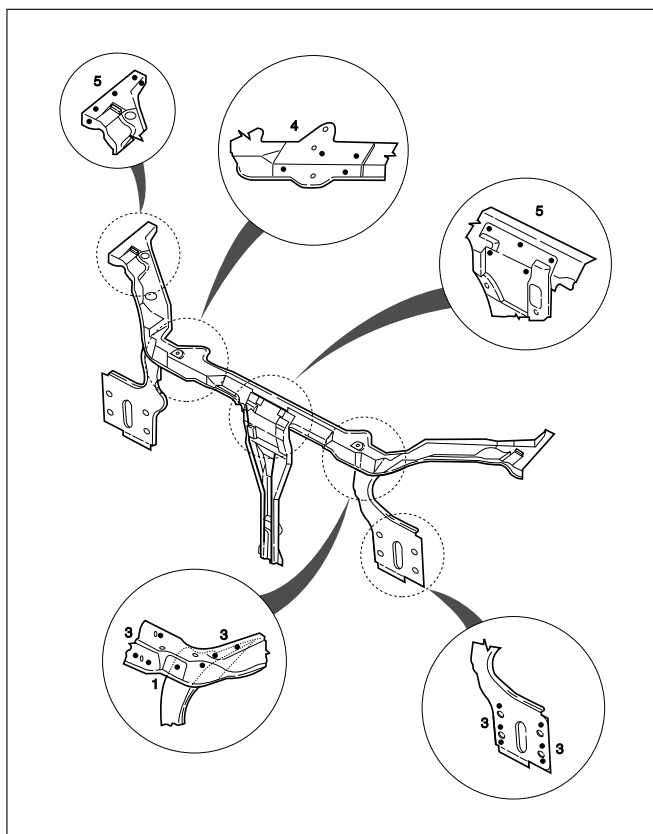


Fig. 7

#### 9. Finish the welding areas.

- Use a hammer and dolly to even out the front wheelhouse and longitudinal flanges for a close fit with the surface of the front panel.

#### 10. Apply the undercoat.

- Undercoat to the damaged areas of front wheelhouse and longitudinal if necessary.

#### 11. Apply the paint.

##### CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.  
Rear the paint label before opening paint container.
- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

#### 12. Coating the anti-rust agents.

- Coating the anti-rust agents to the end of front panel side and the door hinge areas.

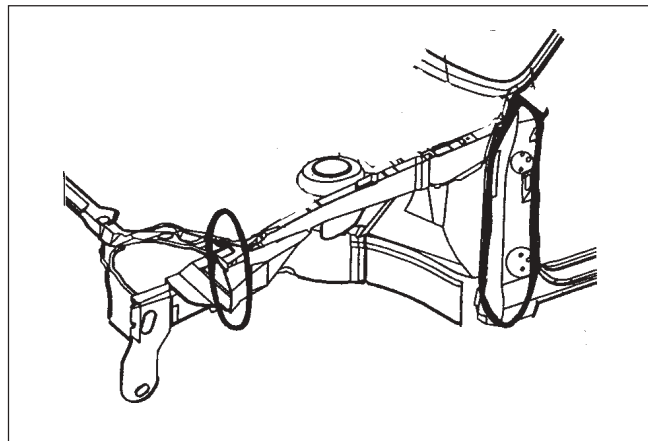


Fig. 8

#### 13. Install the related parts.

- Engine, radiator and related parts.
- Aircon condenser and related parts.
- Head lamps and fenders.
- Hood, radiator grill, and bumper.
- Others.
- Install in the reverse order in which they were removed.

**NOTE:** After install the all related parts, rub in grease to the moving parts and replenish cooling liquid, break oil, aircon gas and others.

#### 14. Check and adjust

- Check clearances and level differences.
- Check the hood locking and unlocking condition.
- Adjust the head lamp aim.
- Check all operation.
- Check for gas, oil and liquid leaks.

**NOTE:** Use specified check sheet for operation check properly.

## 2. FRONT WHEELHOUSE

### 2-1. GENERAL DESCRIPTION

The front wheelhouse component is constructed as a unit with the locator shockabsorber. Therefore, replacement of the component affects the front wheel alignment. When assembling it, either use a jig or follow dimensions on the body repair chart for positioning. It must be welded carefully.

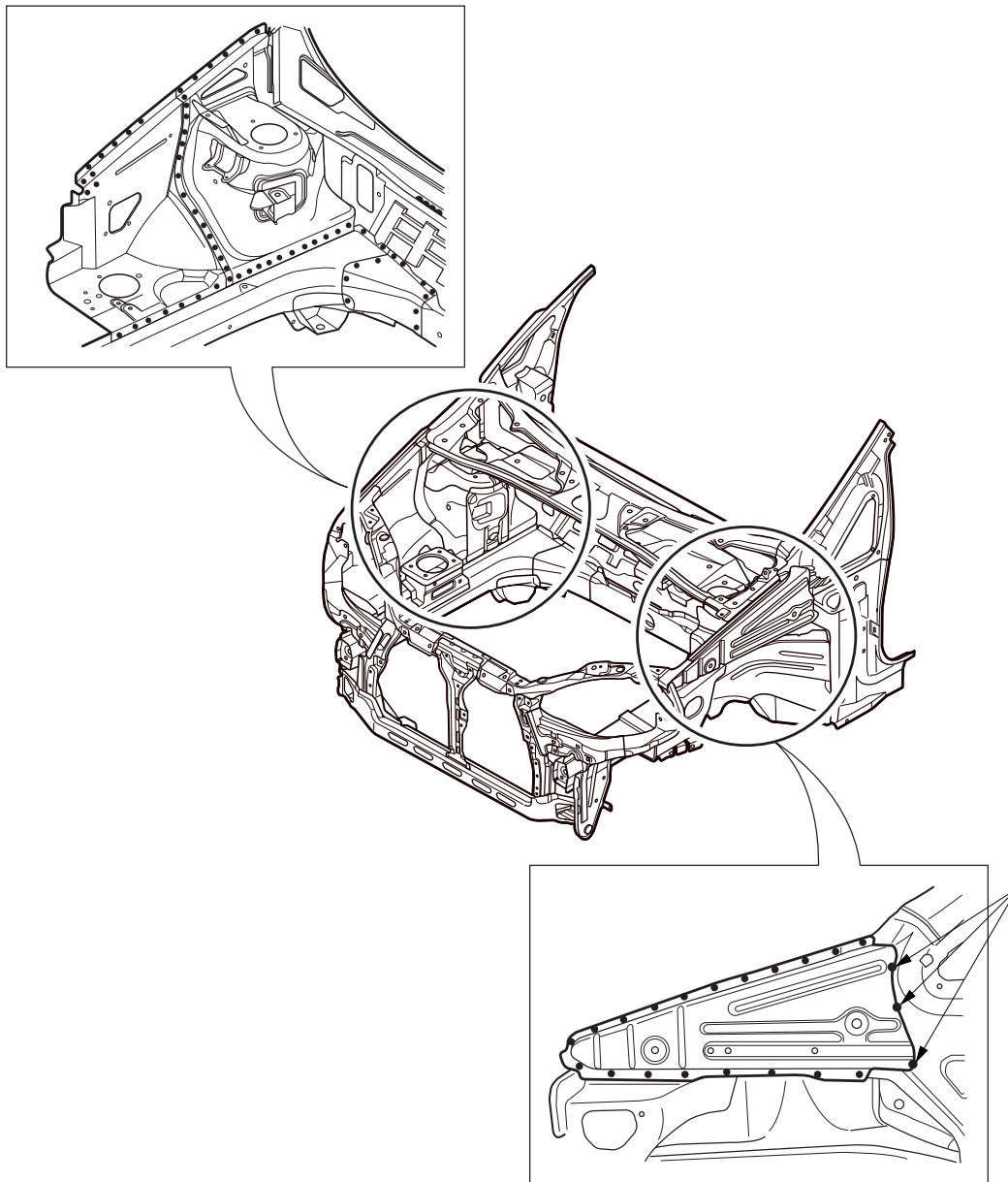


Fig. 9 Front Wheelhouse Welding Assembly

## 2-2. REPAIR PROCEDURE

1. Remove the related parts.
  - Parts to be removed when removing the front panel.
  - Parts on passenger side of dash panel lower which are especially flammable.
  - Instrument panel, wiring harness, related parts and others.
2. Roughly pull out and straighten the damaged area to approximately the original shape.
  - Attach the car to the frame straightener by tightening the underbody clamps at the horizontal pinch weld points.
  - Before cutting off the damaged sections, pull them out so that they are restored to the original shape.
  - Do not pull out more than necessary.
  - Pull out and straighten the damaged areas of the rear wheelhouse and dash panel lower, front filar and other parts.

**NOTE:** Check the condition of the door and hinges.

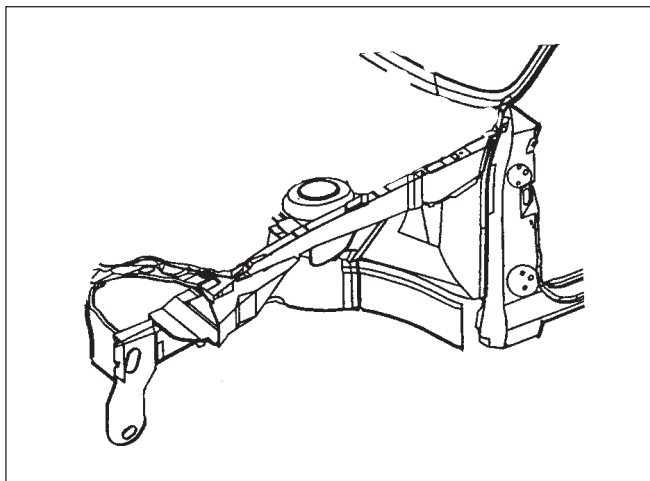


Fig. 10

3. Remove the brace wheelhouse.
  - Center punch around the spot weld imprints.
  - Use the special spot cutter to drill holes at the spot weld nuggets on the brace wheelhouse.
  - Remove the MIG weld areas with a disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

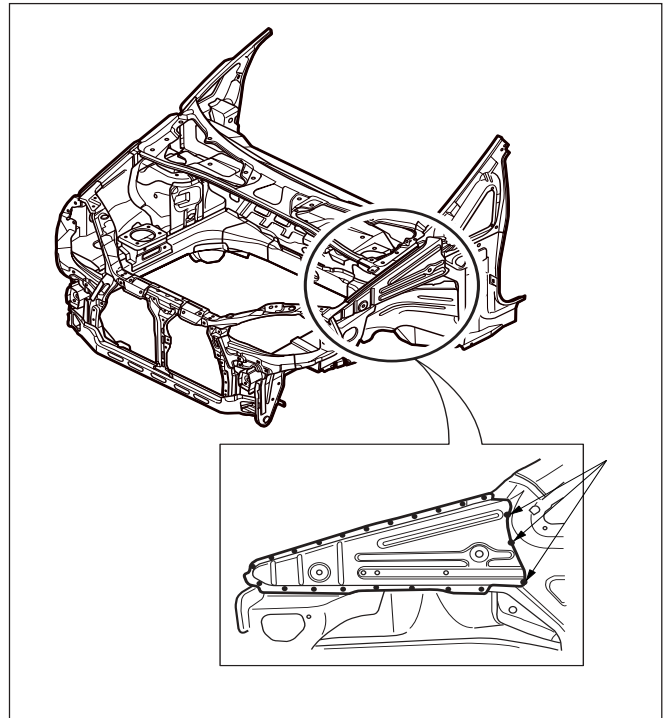


Fig. 11

- Using a chisel, pry off the welded flange from the front body puller and wheelhouse.
4. Peel off the undercoat and sealer.
    - Heat the undercoat and sealer at the welding areas of the wheelhouse and longitudinal with a gas torch and peel off the undercoat and sealer with a steel spatula.
  5. Cut and pry off the front wheelhouse.
    - Center punch around the spot weld imprints on the longitudinal and rear wheelhouse.
    - Use the special spot cutter to drill holes at the spot weld nuggets on the center punched areas.
    - Cut off the front wheelhouse with an air chisel, leaving the welding flanges intact.
    - Level and finish the burrs from the pried off spot welds with disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

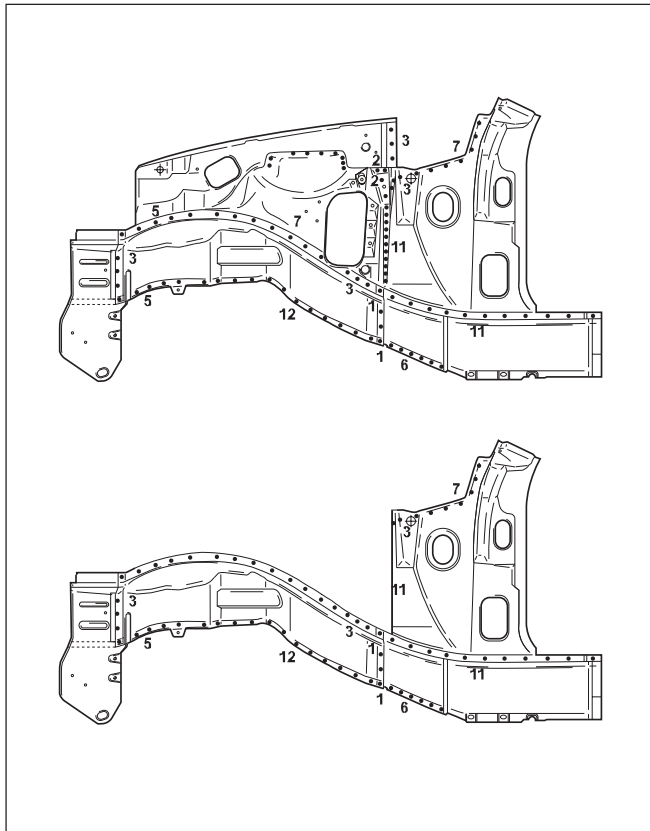


Fig. 12

**NOTE:**

- If damage has occurred only front side, cut the damaged section of the front wheelhouse, trim the new panel to fit the remaining section, then butt weld both parts at the inner ends.

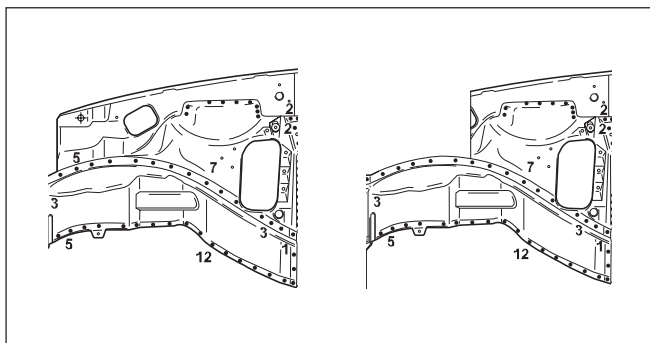


Fig. 13

## 6. Mold damaged related parts.

- Fill any holes drilled by welding.

- Use a hammer and dolly to mold damaged areas of the front longitudinal, rear wheelhouse and other panels.
- Even out the welding flanges with a hammer and dolly.

## 7. Set the new front wheelhouse panel.

- Grind both sides of the welding section of the front, rear wheelhouse and front longitudinal with a disc sander to remove the paint and expose the steel plate.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Clamp to the front longitudinal with vise grips and squill vises.
- Clamp the front panel with vise grips.

**NOTE:** Use of jigs is recommended.

- Weld the clamped sections for temporary installation.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

## 8. Measure the front compartment diagonally.

- Measure the front compartment diagonally with a tracking gauge or convex rule to check it for twisting or bending.
- Temporarily assemble the fender and hood, then check the clearances and level differences.

## 9. Perform the main welding.

- Weld as much as possible with the jig still mounted.
- Perform a trial welding first, and check the welding condition.
- Perform the welding.



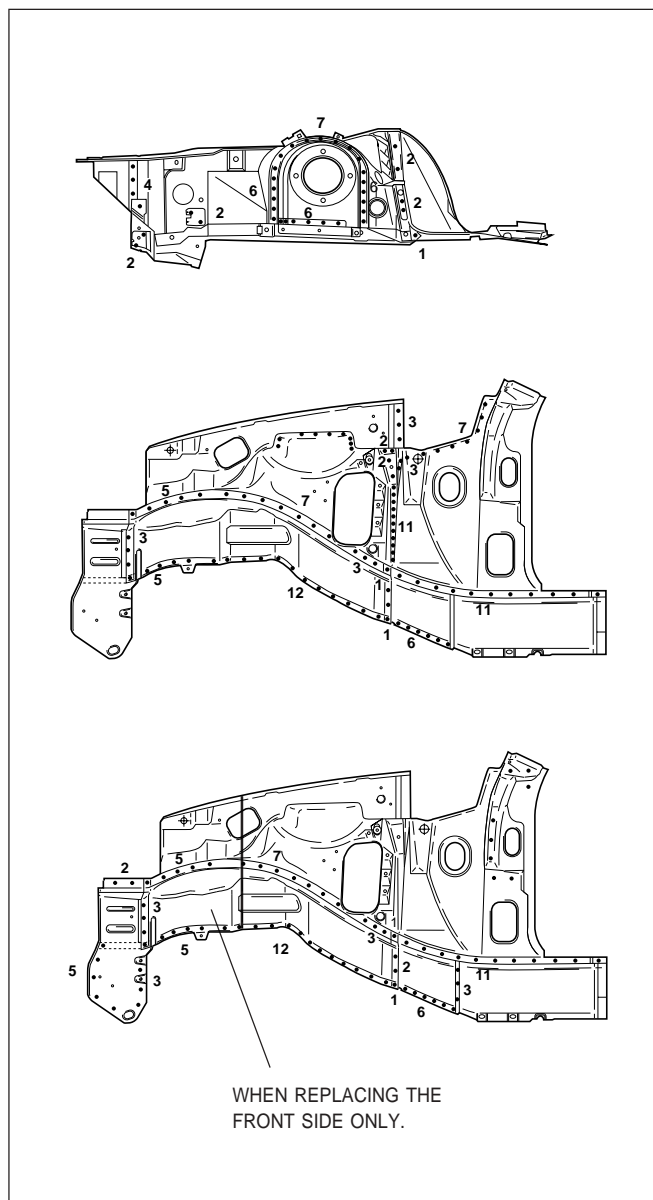


Fig. 14

**CAUTION :** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Increase the number of spot by 20% for areas to be spot welded.

10. Apply the sealer tape.

- Apply the sealer tape to the hinge and brace wheelhouse matching area as shown.

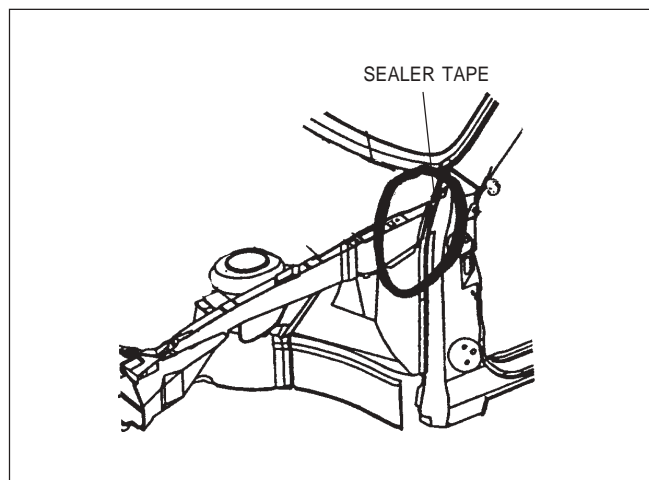


Fig. 15

11. Weld the brace wheelhouse.

- Spot weld the brace wheelhouse as shown.
- Make MIG or gas welds at the door hinge areas.

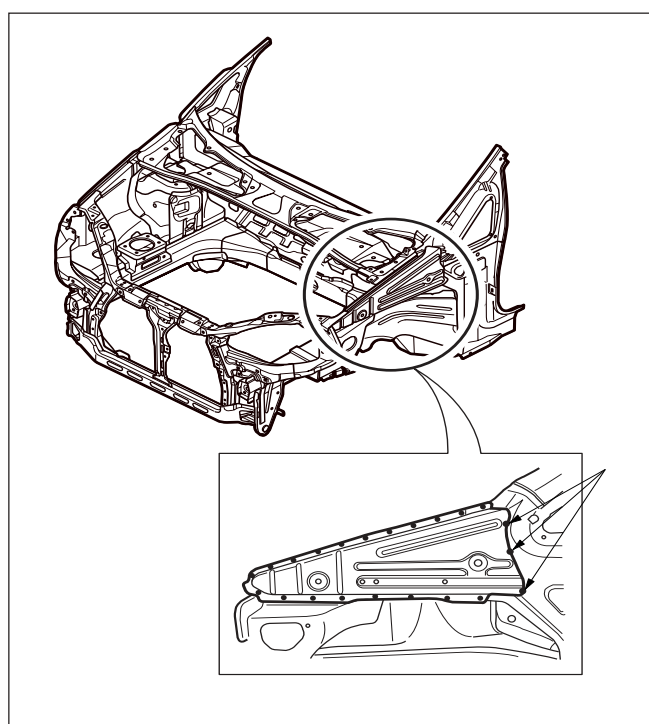


Fig. 16

12. Finish the welding areas.

- Use a hammer and dolly to even out the rear wheelhouse and front longitudinal flanges for a close fit with the surface of the front wheelhouse.



13. Apply the sealer

- Apply the sealer to the matching and overlapped surface.

14. Apply the undercoat.

- Undercoat to the inside of the front, rear wheel-house and longitudinal.

15. Apply the paint.

**CAUTION**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

16. Coating the anti-rust agents.

- Coating the anti-rust agents to the end of front panel side and the door hinge areas.

17. Install the related parts.

- Wiring harness, instrument panel and related parts.
- Parts of the passenger compartment.
- Parts to be installed when install the front panel.
- Others.
- Install in the reverse order in which they were removed.

**NOTE:** After install the all related parts, rub in grease to the moving parts and replenish cooling liquid, break oil, aircon gas and others.

18. Check and adjust

- Measure the front wheel alignment.
- Check clearances and level differences.
- Check the hood locking and unlocking condition.
- Adjust the head lamp aim.
- Check all operation.
- Check for gas, oil and liquid leaks.

**NOTE:** Use specified check sheet for operation check properly.

### 3. FRONT LONGITUDINAL

#### 3-1. GENERAL DESCRIPTION

The front longitudinal is joined to the wheelhouse and front panel, it forms the base for the front suspension, engine, transmission and others. Therefore, replacement of the component affects the front wheel alignment and maintains the rigidity of the front section. When assembling it, either use a jig or follow dimensions on the body repair chart for positioning. It must be welded carefully.

#### 3-2. REPAIR PROCEDURE

##### 1. Remove the related parts.

- Parts to be removed when removing the front panel and front wheelhouse.
- Parts on passenger side of dash panel lower which are especially flammable.
- Instrument panel, wiring harness, related parts and others.

**NOTE:** Remove according to part damaged.

##### 2. Roughly pull out and straighten the damaged area to approximately the original shape.

- Attach the car to the frame straightener by tightening the underbody clamps at the horizontal pinch weld points.
- Before cutting off the damaged sections, pull them out so that they are restored to the original shape.
- Roughly cut off the front longitudinal according to the extent of damage before roughly pulling out the damage makes repair of the related parts difficult.
- Do not pull out more than necessary.

**NOTE:** Check the condition of the door and hinges.

##### 3. Peel off the undercoat and sealer.

- Heat the undercoat and sealer at the welding areas of the damaged parts with a gas torch and peel off the undercoat and sealer with a steel spatula.

**CAUTION:** Be careful not to burn the fittings inside the passenger compartment when heating.

##### 4. Cut and pry off the front longitudinal.

**NOTE:** It's not necessary to separate the wheelhouse from the front longitudinal if the wheelhouse is to be replaced also.

- Center punch around the spot weld imprints on the wheelhouse and other related parts.
- Use the special spot cutter to drill holes at the spot weld nuggets on the center punched areas.
- Cut off the front longitudinal with an air chisel, leaving the welding flanges intact.
- Level and finish the burrs from the pried off spot welds with a disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

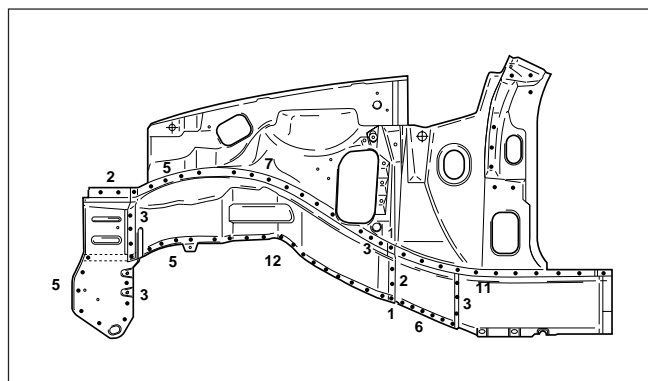


Fig. 17

##### 5. Mold damaged related parts.

- Fill any holes drilled by welding.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Reshape the wheelhouse and other damaged parts and even out the welding flanges with a hammer and dolly.

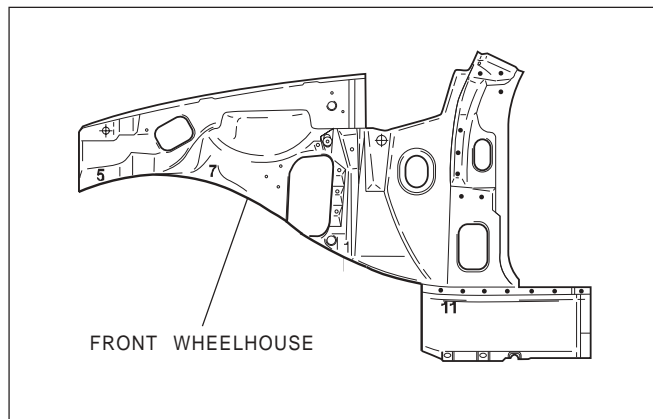


Fig. 18

6. Cut the new front longitudinal to align it with body, then set the wheelhouse and front panel.
  - Cut the new front longitudinal with a hand saw and it will be butt welded.
  - Grind both sides of the welding section of the front longitudinal and wheelhouse with a disc sander to remove the paint and expose the steel plate.

**CAUTION :** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Tighten the new front longitudinal against remaining parts with the vise grips and pliers.
- Place a jack under the front longitudinal end and support it, and measure the positions for correct setting.
- Set and clamp the front panel in place with the vise grips.

**NOTE:** Use of jigs is recommended for correct positions and check that the both front longitudinal and wheelhouse are parallel.

- Tack weld the clamped section for temporary installation.

#### 7. Perform the main welding.

- Weld as much as possible with the jig still mounted.
- Make MIG or gas welds at the butt joints at the front longitudinal, carefully.

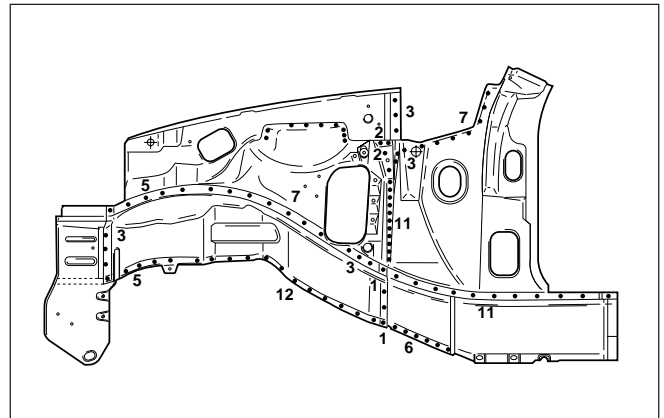


Fig. 19

- Spot weld the wheelhouse with the front longitudinal flange areas and front panel.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

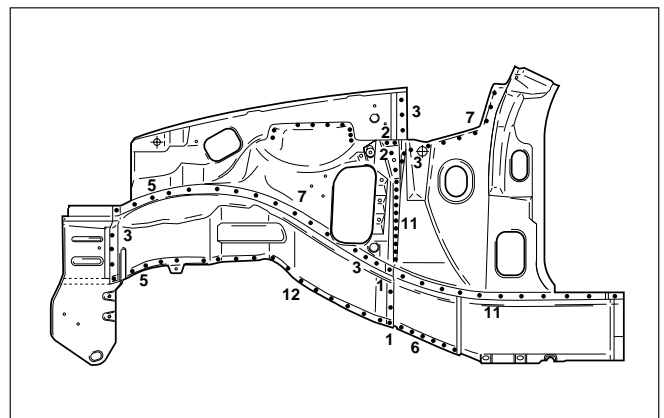


Fig. 20

- Level the weld beads at the longitudinal butt joints area with disc sander.
- Make the stiffener(Thickness: 2.8 mm Min., Width: 80 mm) according to the form of longitudinal butt joint areas and weld the stiffener at the longitudinal butt joint areas with MIG welder.

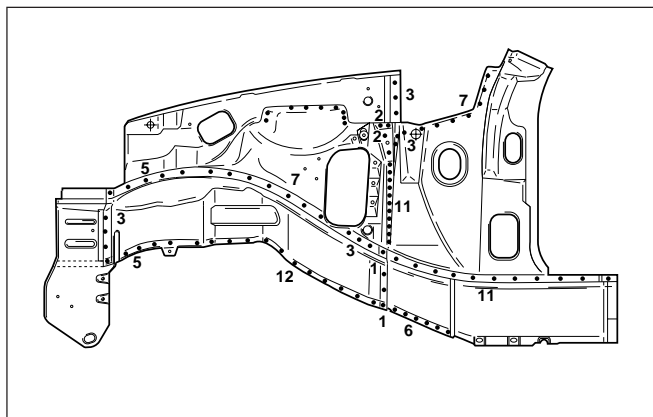


Fig. 21

#### 8. Finish the welding areas.

- Level the gas or MIG welded areas with disc sander.
- Use a hammer and dolly to even out the wheel-house and longitudinal flanges for a close fit.

#### 9. Apply the sealer.

- Apply the sealer to the joint areas of the dash panel lower and floor panel areas.

#### 10. Apply the undercoat.

- Undercoat to the joint and overlapped areas of the front floor, longitudinal under side and the inside of front, rear wheelhouse.

#### 11. Apply the paint.

##### **CAUTION:**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.  
Read the paint label before opening paint container.
- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

#### 12. Coating the anti-rust agents.

- Coating the anti-rust agents to the end of front panel side and the front door hinge areas.

#### 13. Install the related parts.

- Clean the passenger compartment.
- Wiring harness, instrument panel and related parts.
- Parts of the passenger compartment.
- Chassis components.
- Engine, radiator and related parts.
- Aircon condenser and related parts.
- Head lamps and fenders.
- Head, radiator grill, and bumper.
- Others.
- Install in the reverse order in which they were removed.

**NOTE:** After install the all related parts, rub in grease to the moving parts and replenish cooling liquid, break oil, aircon gas and others.

#### 14. Check and adjust

- Check clearances and level differences.
- Check the hood locking and unlocking condition.
- Adjust the head lamp aim.
- Check all operation.
- Check for gas, oil and liquid leaks.
- Check for water leaks in the passenger compartment.

**NOTE:** Use specified check sheet for operation check properly.

## 4. SUPPORT CONTROL ARM

### 4-1. GENERAL DESCRIPTION

The support control arm is joined to the front longitudinal and crossmember front floor panel. It forms the base for the front suspension and is maintaining the rigidity of the front parts. Pay particular attention to the position and dimensions of the weld joints and weld carefully.

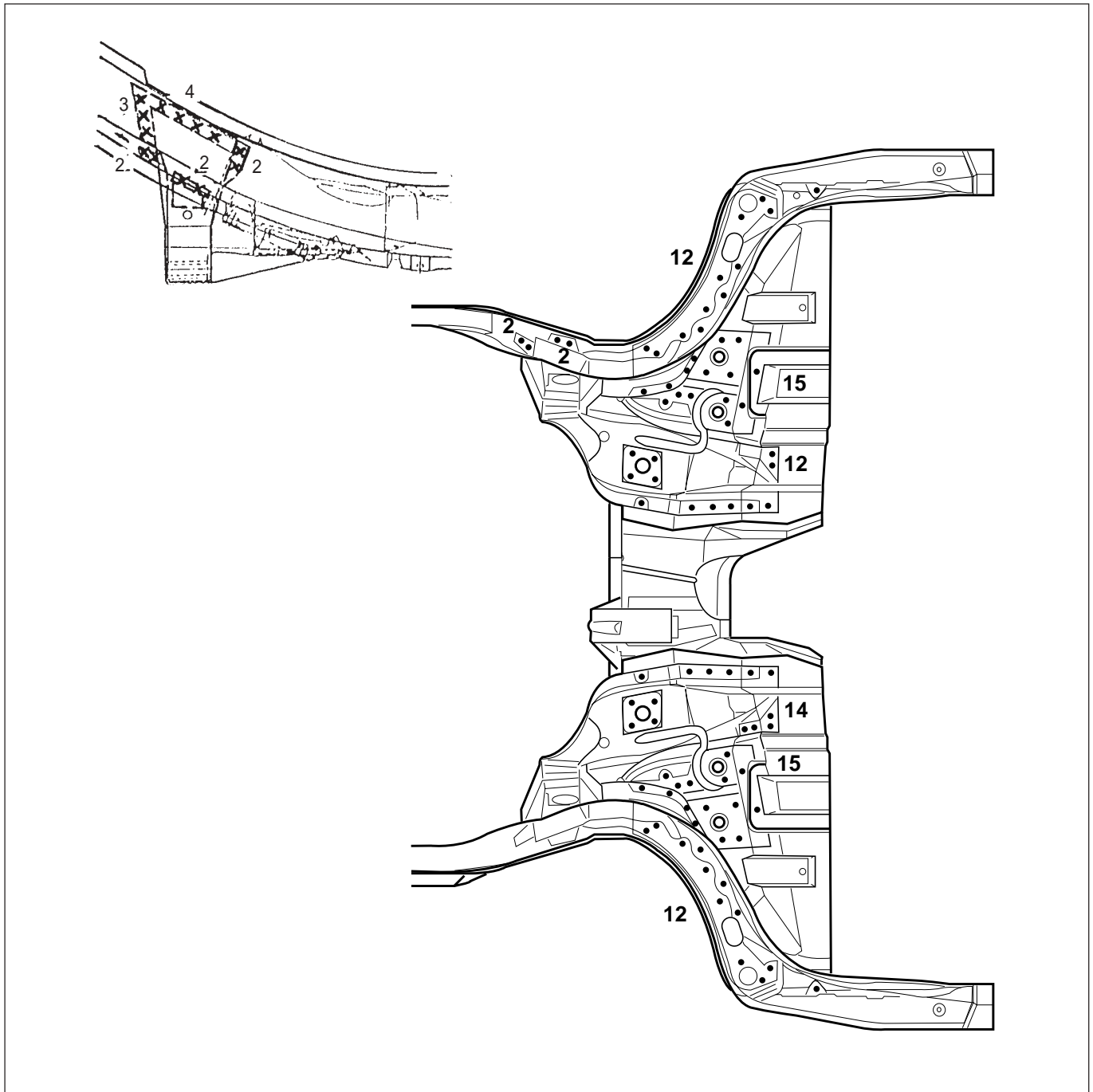


Fig. 22 Support Control Arm Welding Assembly

## 4-2. REPAIR PROCEDURE

### 1. Check the damaged areas.

- Check the damaged parts and the extent of damage properly.
- The support control arm receives impact through the front longitudinal.

Such impact generally requires replacement of all these parts.

### 2. Remove the related parts.

- Front seats.
- Trims and carpet.
- Wiring harness and others.
- Parts to be removed when removing the front longitudinal.

**NOTE:** Remove according to part damaged.

### 3. Pull out and straighten the damaged area to approximately the original shape.

**NOTE:** Use heat-resistant protective cover for protect painting areas, seats, carpets and other parts.

- Before cutting off the damaged parts, pull out the damaged area with the frame straightener and correct the related parts such as the crossmember front floor panel and front floor panel.
- Do not pull out more than necessary.
- Check the clearance and level difference of the front doors.
- Jack up the body and place safety stands at the four designated places of the frame door opening. If necessary, place safety stands at the rear of frame.

### 4. Peel off the undercoat, sealer and deadner.

- Heat the undercoat and sealer at the welding areas of the longitudinal, cross member front floor panel and front floor panel with a gas torch and peel off the under with a steel spatula.
- Peel off the deadner at the surface or front floor.

**CAUTION:** Be careful not to burn the fittings inside of the passenger compartment when heating.

### 5. Cut and pry off the support control arm.

- Center punch around the spot weld imprints on the support control arm.
- Use the special spot cutter to drill holes at the spot weld nuggets on the center punch areas.

**NOTE:** When drilling holes be careful not to drill down to the crossmember front floor panel and other remaining parts.

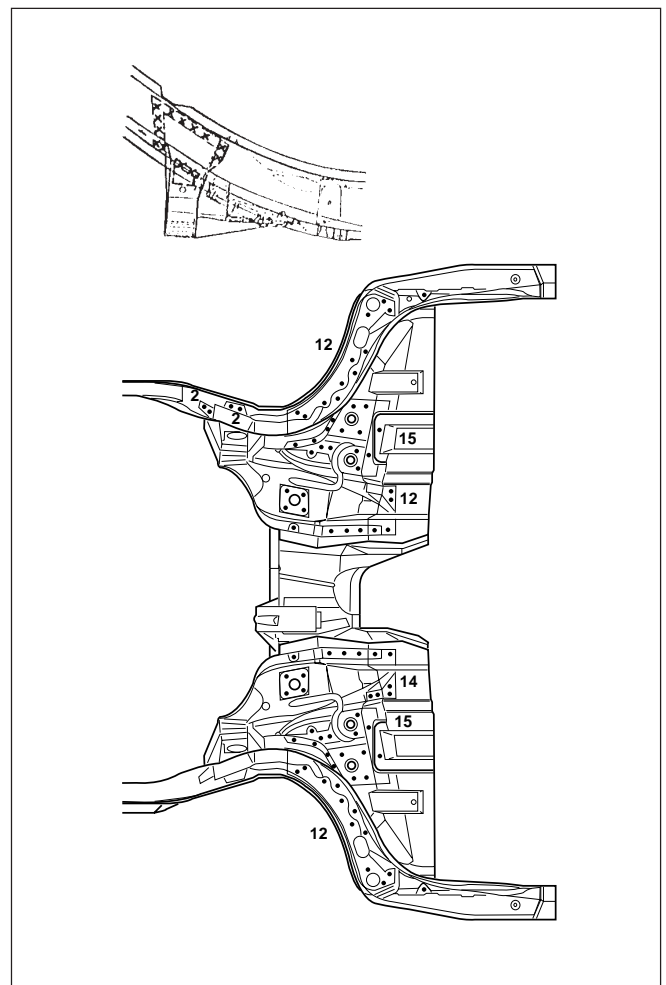


Fig. 23

- Cut and pry off the support control arm with an air chisel, leaving the welding flanges intact.
- Level and finish the burrs from the drilled holes and pried off spot welds with disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

**NOTE:** Check again the extent of damage and crack.

## 6. Mold damaged related parts.

- Reshape the dash panel lower, crossmember front floor panel and other related parts with a hammer and dolly.
- Even out the welding areas with a hammer and dolly.
- Fill any holes drilled by welding.

## 7. Set the new support control arm.

- Preset the new support control arm at the position and marked welding position and will be welded by MIG plug welding.
- Increase the number of plug welding by 20%.
- Drill holes through the marked position with a 5 mm drill for MIG plug welding.

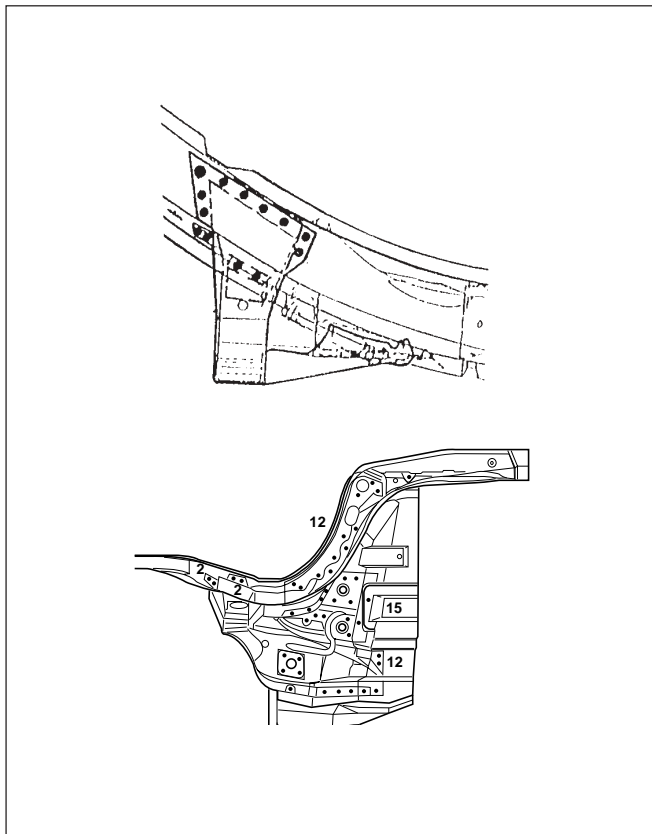


Fig. 24

- Grind both sides of the welding section of the support control arm and the matching surface of parts with a disk sander to remove the paint and expose the steel plate.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Set the support control arm in place using a jack and clamp with the vise grips.

**NOTE:** Use of jigs is recommended for correct positions.

- Check the clearance and even out the flanges for with a hammer and dolly.

## 8. Perform the main welding.

- Plug weld the holes of support control arm with a MIG welder.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

## 9. Finish the welding areas.

- Level the plug welded areas with a disc sander.

## 10. Apply the sealer.

- Apply the sealer to the inside of passenger compartment joint areas.

## 11. Apply the undercoat.

- Undercoat to the surface of front floor, crossmember front floor, support control arm and others.

## 12. Apply the paint.

**CAUTION**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

## 13. Apply the deadner.

- Clean the passenger compartment.
- Apply the deadner to the surface of floor panel.

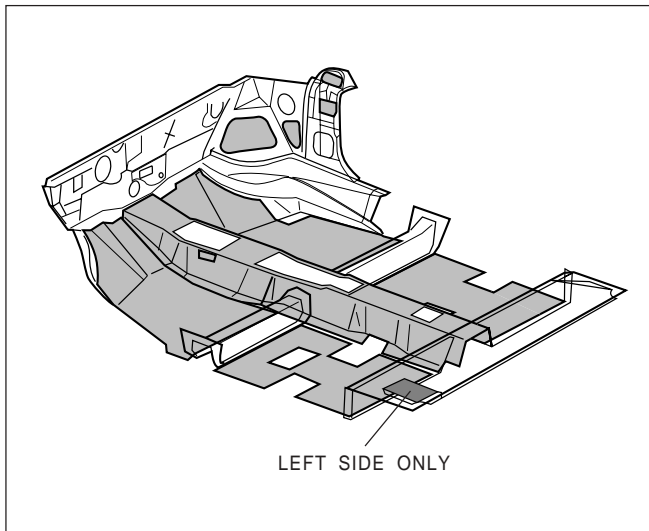


Fig. 25

## 14. Install the related parts.

- Clean the passenger compartment.
- Wiring harness and related parts.
- Parts of the passenger compartment.
- Chassis components.
- Parts of the front compartment.
- Hood, radiator grill, and bumper.
- Other.
- Install in the reverse order in which they were removed.

**NOTE:** After install the all related parts, rub in grease to the moving parts and replenish cooling liquid, break oil, aircon gas and others.

## 15. Check and adjust

- Measure the front wheel alignment.
- Check clearances and level differences.
- Check the hood locking and unlocking condition.
- Adjust the head lamp aim.
- Check all operation.
- Check for gas, oil and liquid leaks.
- Check for water leaks in the passenger compartment.

**NOTE:** Use specified check sheet for operation check properly.



## 5. FRONT PILLAR

### 5-1. GENERAL DESCRIPTION

The front pillar area is part of the frame door opening panel. It's connected to the roof, windshield, door hinges and floor frame and is important as a support for the front side of the cabin. Connection of the front pillar determines the position of the windshield and front door. Align the fender, door and windshield while the front pillar is temporary mounted, and check the clearances and level differences.

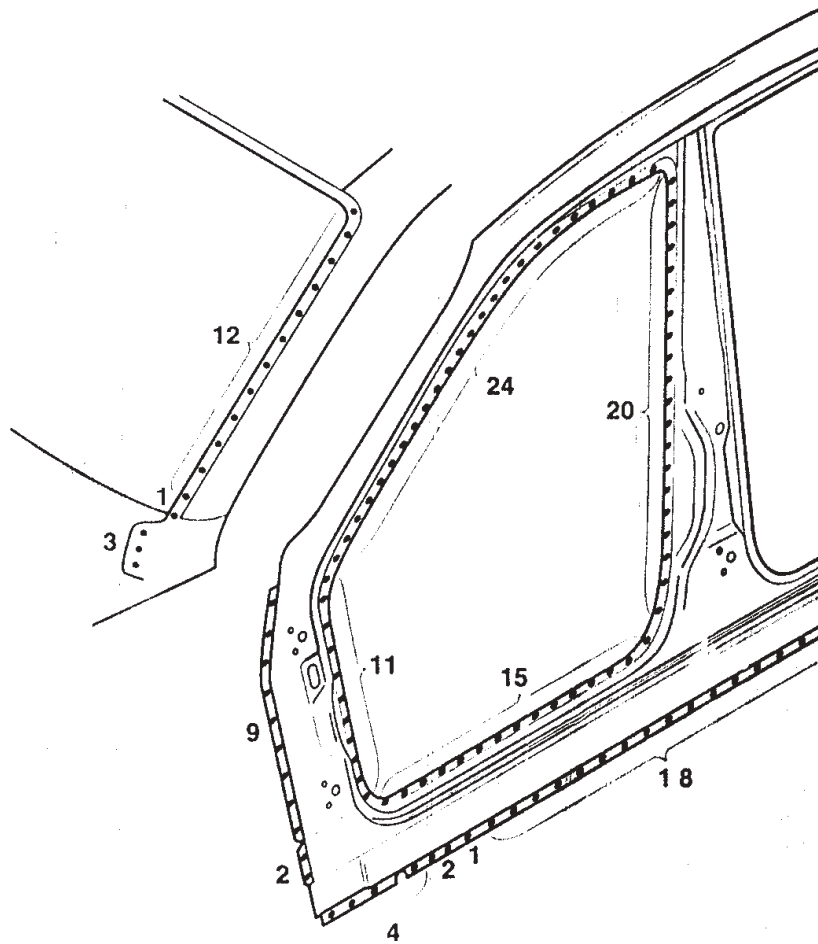


Fig. 26 Front Pillar Welding Assembly

## 5-2. REPAIR PROCEDURE

1. Remove the related parts.
  - Hood, radiator grill and front bumper.
  - Door and fender.
  - Wiper, cowl and windshield.
  - Weatherstrip and pillar trims.
  - Instrument panel and wiring harness.
  - Carpet and others.
2. Roughly pull out and straighten the damaged area.
  - Check the damage to the wheelhouse and roof before removing the brace wheelhouse and front pillar and determine the extent of the damage.
  - Use the frame straightener to roughly pull out and repair the damaged front pillar before removing the brace wheelhouse and front panel.

**NOTE:** Pull out until the pillar is lined up with the surface of the windshield and do not pull out more than necessary.

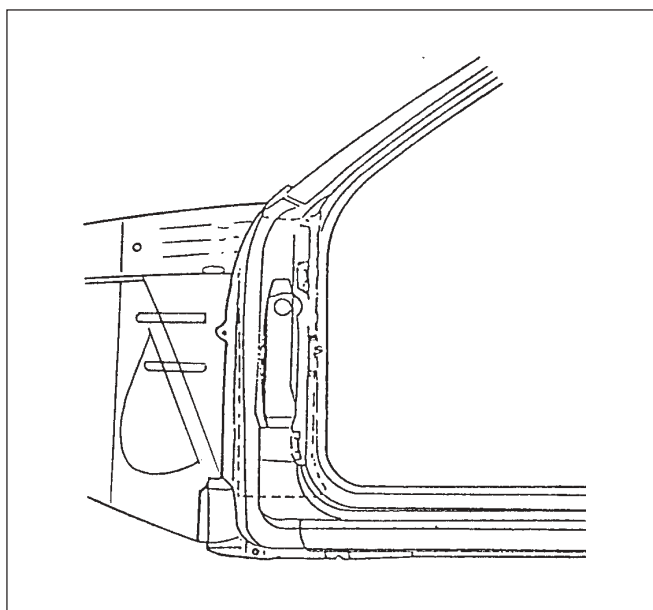


Fig. 27

3. Remove the brace wheelhouse.
  - Center punch around the spot weld imprints.
  - Use the special spot cutter to drill holes at the spot weld nuggets on the brace wheelhouse.
  - Remove the MIG weld areas with a disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Using a chisel, pry off the welded flange from the front body pillar and wheelhouse.

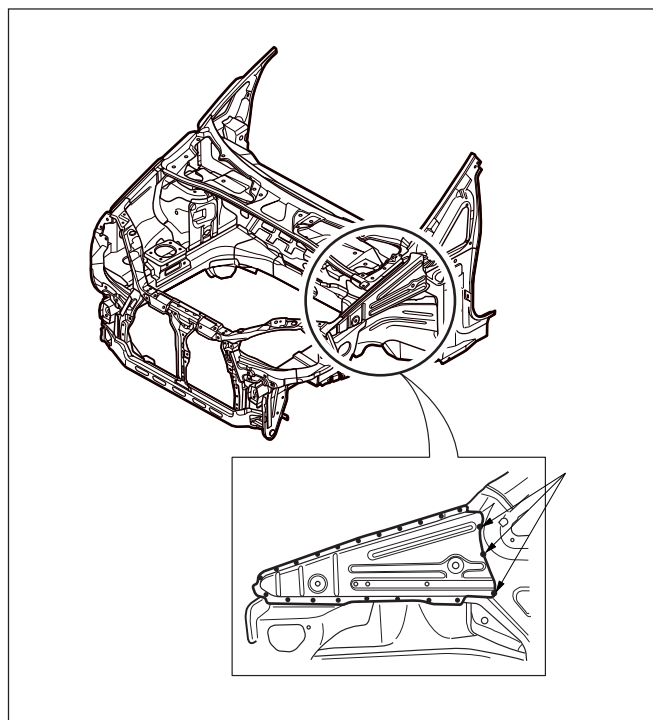


Fig. 28

4. Peel off the undercoat and sealer.
  - Heat the undercoat and sealer at the welding areas of the wheelhouse and longitudinal with a gas torch and peel off the undercoat and sealer with a steel spatula.
5. Cut and pry off the front pillar.
  - Cut off the front pillar along the bold lines as shown in the figure below with a handsaw and snips carefully.

**NOTE:** Be careful not to cut the inner section.

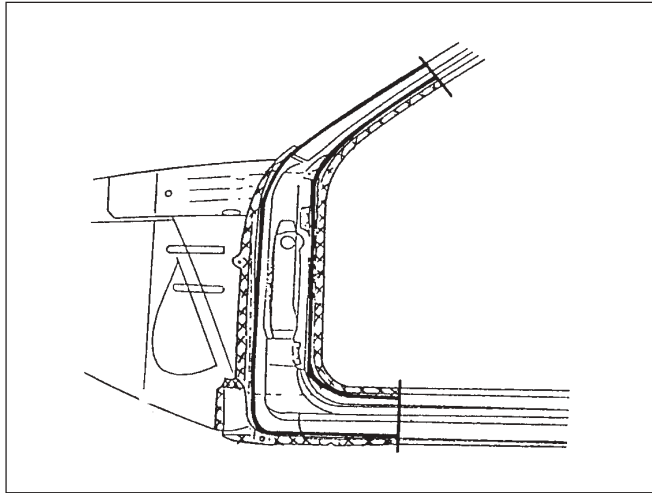


Fig. 29

- Center punch around the spot weld imprints with the rear wheelhouse, front body pillar inner, reinforcement front body pillar inner and floor panel side.
- Use the special spot cutter to drill holes at the spot weld nuggets on the front pillar.

**NOTE:** When drilling holes be careful not to drill down to the front body pillar inner, reinforcement front body pillar inner and floor panel side themselves.

- Pry off the remaining flanges from the body with an air chisel and leaving the welding flanges.
- Level and finish the burrs from the pried off spot welds with a hammer, dolly and disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

#### 6. Mold damaged related parts.

- Fill any holes drilled by welding.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Use a hammer and dolly to mold damaged areas of the remaining inner panel and even out the welding flanges.

#### 7. Set the new front pillar.

- Align the new part with the top section, then cut

it with a hand saw.

- Cut the floor panel side joint area so it will overlap by 30mm(1.18in.) in the floor panel side with a hand saw.
- Grind both sides of the welding section with a disk sander to remove the paint and expose the steel plate.
- Clamp the new panel in place with the vise grips.
- Tack weld the clamped section for temporary installation.

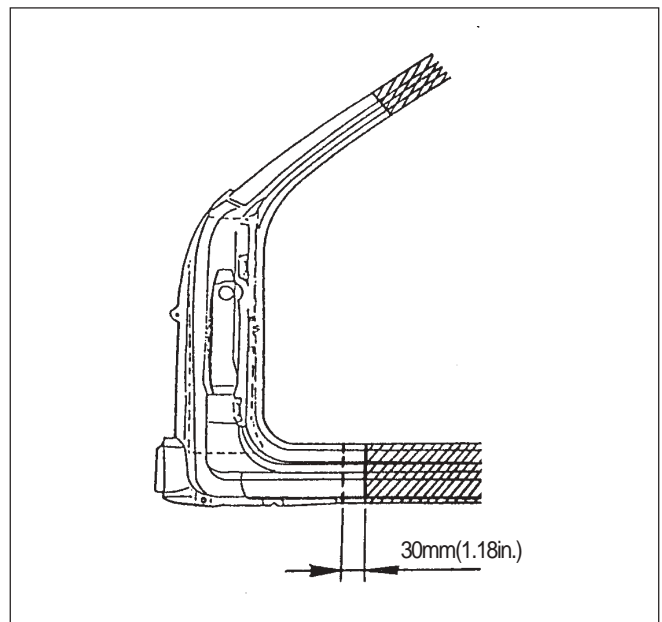


Fig. 30

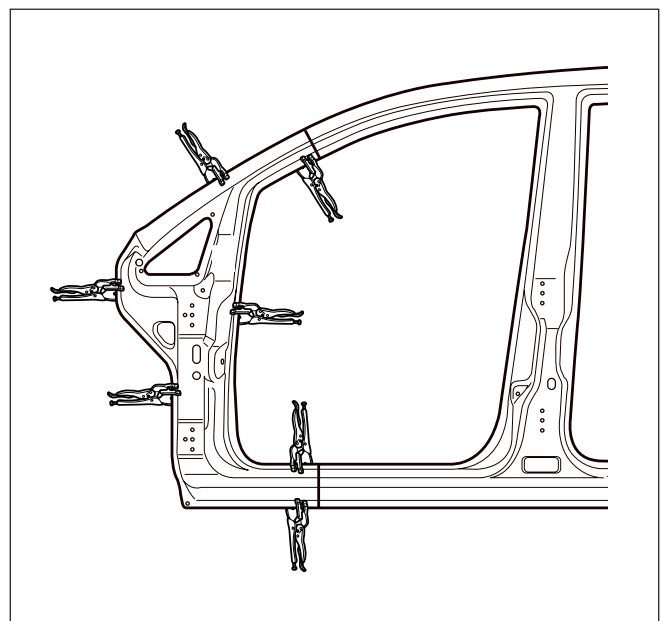


Fig. 31

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Remove the vise grips and temporarily install the fender and doors, then check the clearances, level differences and outer appearance.

8. Perform the main welding.

- Weld the frame door opening area and pillar at the butt joints with a gas or MIG welder.
- Spot weld the flanges of the front pillar as shown.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

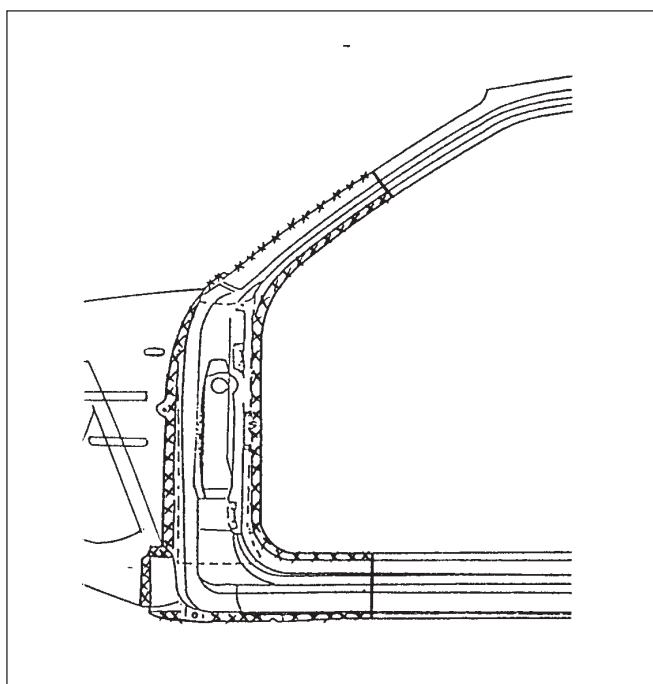


Fig. 32

9. Finish the welding areas.

- Level the gas or MIG welded areas with a disc sander, then even out high areas with a hammer being careful not to deform them.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding cutting or grinding.

- Use a hammer and dolly to even out the spot welded flanges for a close fit with the surface of the inner panel.
- Fill in deformations and level differences of the welded areas with solder or putty, then finish.

10. Apply the sealer tape.

- Apply the sealer tape to the hinge and brace wheelhouse matching area as shown.

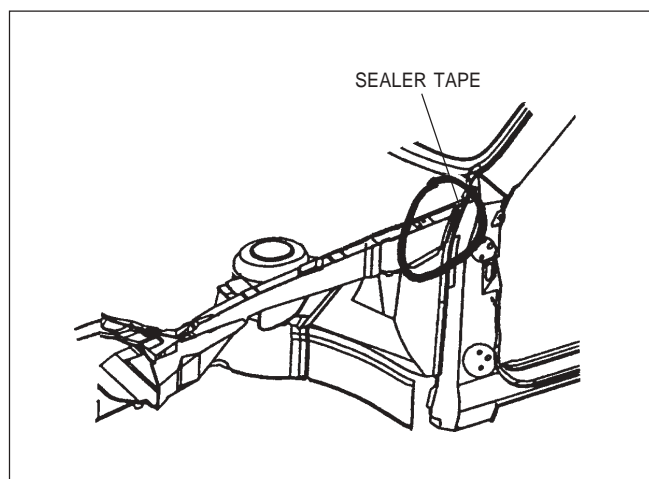


Fig. 33

11. Weld the brace wheelhouse.

- Spot weld the brace wheelhouse as shown.
- Make MIG or gas welds at the door hinge areas.

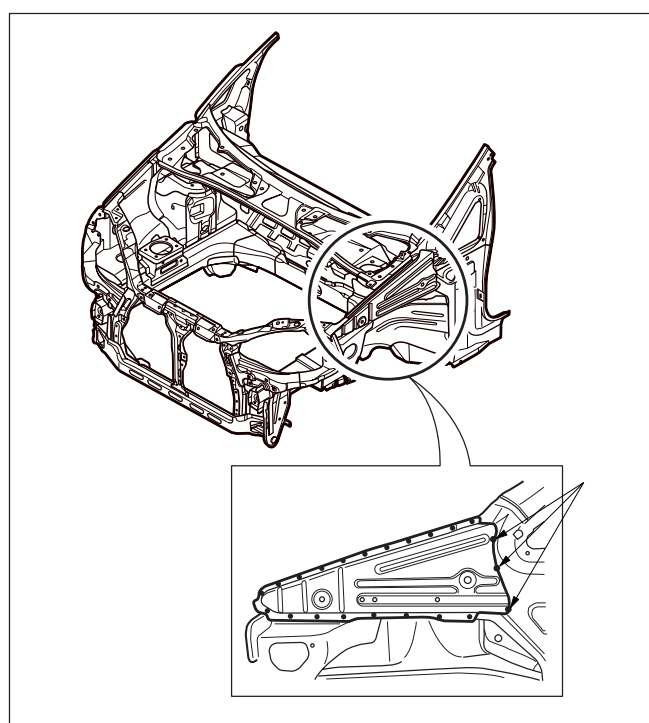


Fig. 34

12. Finish the welding areas.

- Use a hammer and dolly to even out the brace wheelhouse for a close fit with the surface of the wheelhouse.

13. Apply the sealer.

- Apply the sealer to the matching and overlapped surface.

14. Apply the undercoat.

- Undercoat to the inside of the front, rear wheelhouse and longitudinal.

15. Apply the paint.

**CAUTION**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

16. Coating the anti-rust agents.

- Coating the anti-rust agents to the end of front panel side and the door hinge areas.

17. Install the related parts.

- Clean the passenger compartment.
- Windshield, cowl and wiper.
- Wiring harness, instrument panel and related parts.
- Carpet, trims and weatherstrip.
- Door.
- Fender and hood.
- Radiator grill, bumper and others.
- Install in the reverse order in which they were removed.

18. Check and adjust.

- Check the door for proper installation and operation.
- Check clearances and level differences.
- Check the hood locking and unlocking condition.
- Check all operation.
- Check for water leaks in the passenger compartment.

**NOTE:** Use specified check sheet for operation check properly.

**SECTION 5**

**ROOF, BACK PANEL AND  
REAR FLOOR PANEL**

**CONTENTS**

**1. ROOF ..... 5-2**

- General description ..... 5-2
- Repair procedure ..... 5-3

**2. BACK PANEL ..... 5-7**

- General description ..... 5-7
- Repair procedure ..... 5-8

**3. REAR FLOOR PANEL ..... 5-11**

- General description ..... 5-11
- Repair procedure ..... 5-12

## 1. ROOF

### 1-1. GENERAL DESCRIPTION

Deformation of the roof panel is highly noticeable in terms of the vehicle's outer appearance. Before replacing the roof, make sure that the body is horizontal.

Before welding the roof panel, adjust the frame door opening flanges so that they contact the roof panel. Pay particular attention to twists and parallelism.

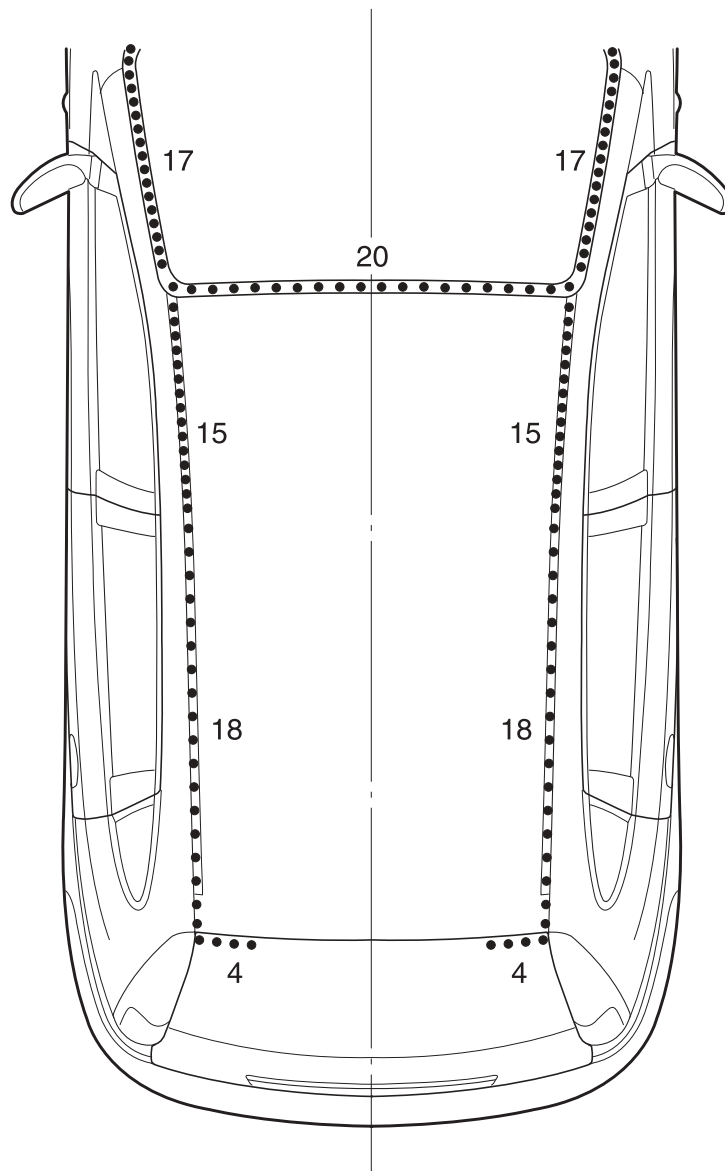


Fig. 1 Roof Welding Diagram

## 1-2. REPAIR PROCEDURE

1. Remove the related parts.
  - Room lamp, door weatherstrip and pillar trims.
  - Headlining and wiring harness.
  - Wiper, cowl and windshield.
  - Rear glass and others.

2. Pull out and straighten the damaged area to approximately the original shape.

**NOTE:** Use heat-resistant protective cover for protect painting areas, seats, carpets and other parts.

- Attach the car to the frame straightener by tightening the underbody clamps at the horizontal pinch welds.
- Before cutting off the roof panel, pull them out so that they are restored to the original shape.
- Do not pull out more than necessary.
- Pull out and straighten the related damaged parts to approximately their original shape.

**NOTE:** Make sure that the right and left pillars are parallel with the windshield surface. Check the door for proper opening and closing.

3. Keep the body, level.
  - Jack up the body, and place safety stands at the four designated places of the frame door opening.
4. Cut off the shaded areas of the roof panel.
  - Cut the roof weld flanges with a hand saw and snips at the roof panel and roof frames.
  - Using a chisel, pry off the roof panel along the bold lines as shown.
  - Center punch around the spot weld imprints of the roof welded flange.
  - Drill holes using the spot cutter.
  - Using a chisel and a disc sander, pry off the welded flange from the front, rear body pillar and roof panel.
  - Level and finish the burrs of welded flanges with a disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

5. Peel off the sealer.
  - Peel off the sealer with a steel spatula at the welding areas of the frame door opening.
6. Mold damaged related parts.
  - Use a hammer and dolly to mold damaged areas of the front, rear body pillar inner and frame door opening.
  - Even out the welding flanges with a hammer and dolly for close fit with the roof panel welding flange.
  - Fill any holes drilled by welding.
7. Set the new panels.
  - Grind both sides of the welding section of the rail windshield header, support roof panel, frame rear roof panel and roof panel with a disc sander to remove the paint and expose the steel plate.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Temporarily set the new three frames and roof panel and clamp with the vise grips.

**NOTE:** Check that the flange surface fit closely. Be careful not to twist or deform the roof panel.

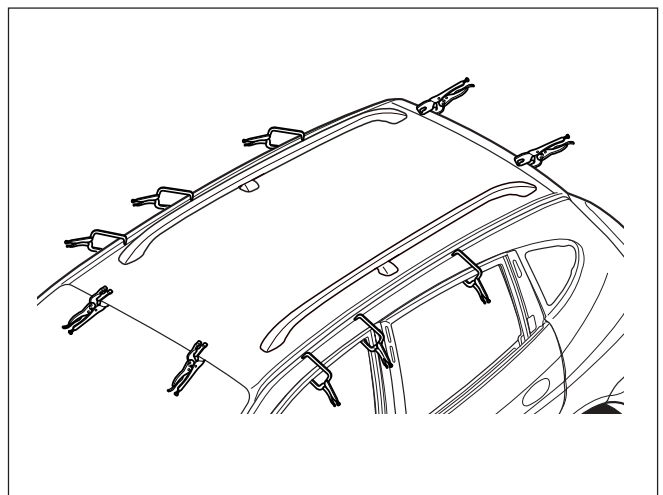


Fig. 2



- Measure the dimensions diagonally at the windshield area and rear glass area with a tracking gauge or convex rule as shown to check it for twisting or bending.

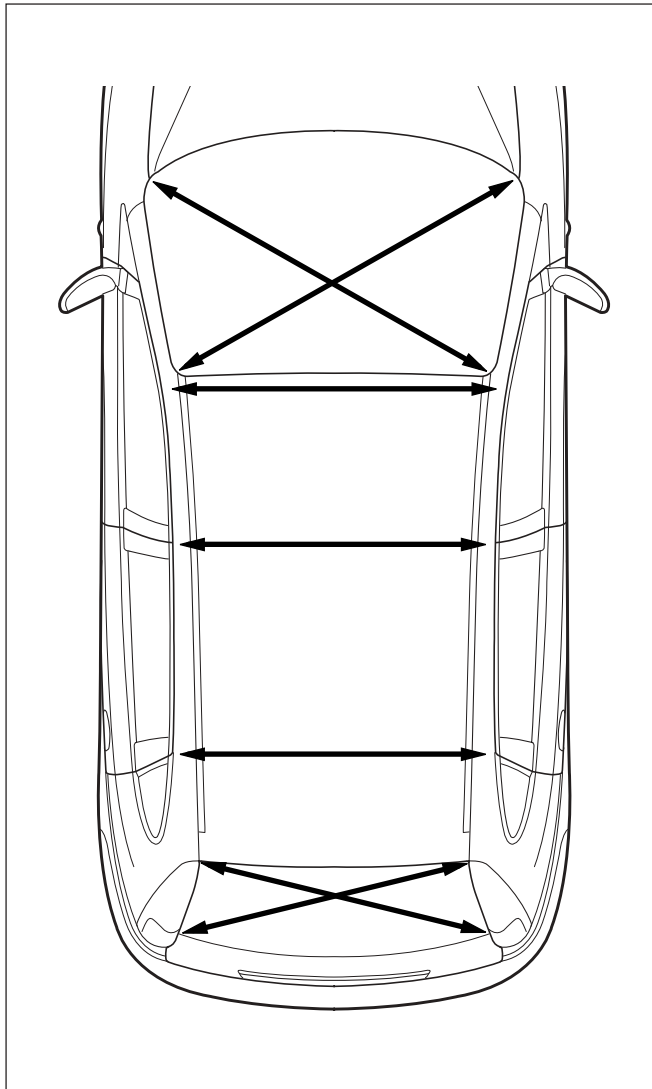


Fig. 3

- Dismantle the new roof panel.
- Weld the clamped sections of the roof frames and front, rear body pillar inner for temporary installation.

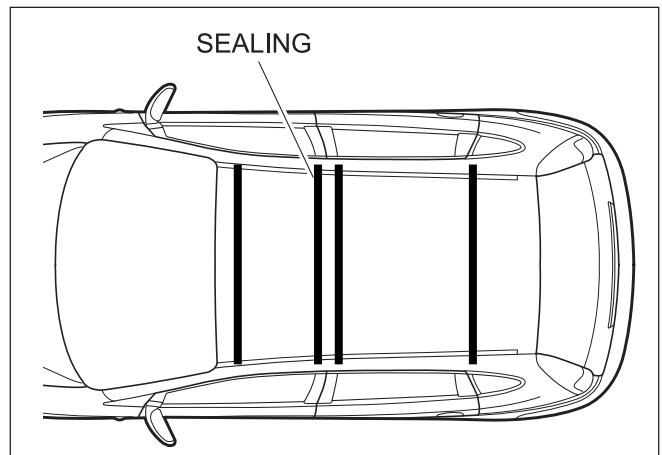


Fig. 4

- Set the new roof panel and clamp again.
  - Temporarily set the windshield and rear glass, and check the roof panel for proper installation.
  - Install the roof molding and check the clearance and outer appearance.
8. Apply the sealer to the roof frames.
- Dismantle the new roof panel again.
  - Apply the sealer to one groove of the rail windshield header, two grooves of the support roof panel and one groove of the frame rear roof panel.
  - Set and tack weld the roof panel.

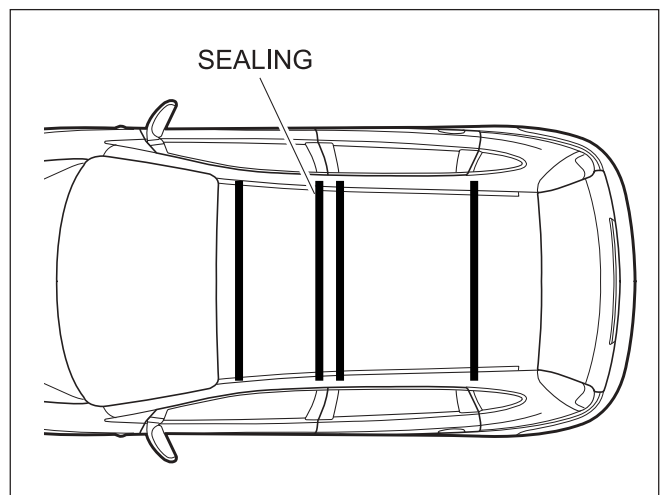


Fig. 5

9. Perform the main welding and finish.

- Spot weld the roof panel.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.
- Use a hammer and dolly to smooth the spot weld areas on the windshield and rear glass.
- Cut off the irregular and useless flanges and even out the flanges for a close fit with the surface of the roof panel.

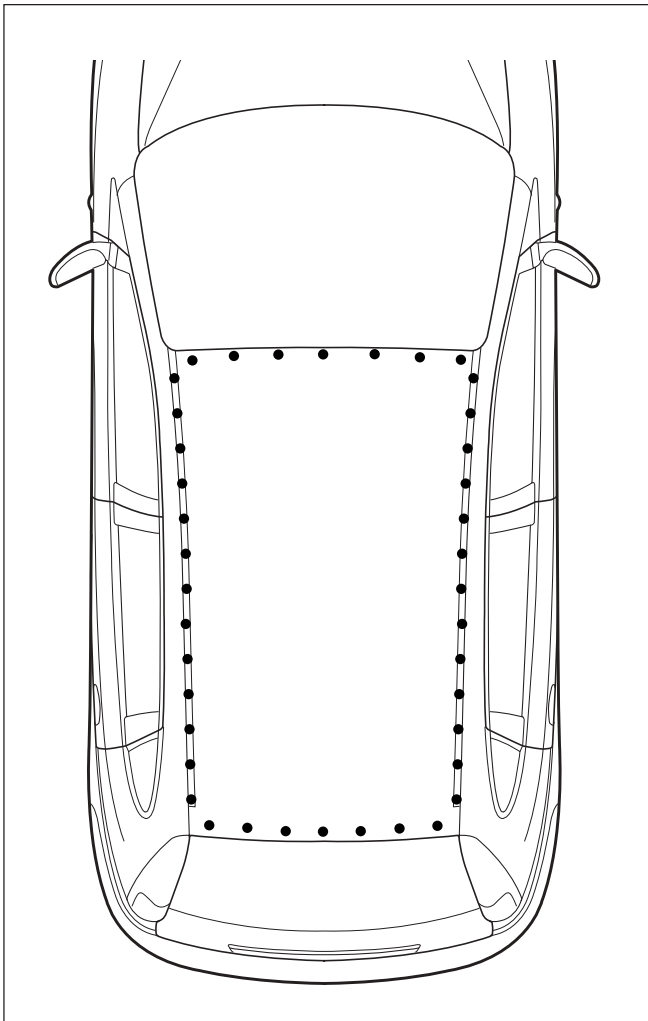


Fig. 6

10. Apply the sealer.

- Apply the sealer to the welded areas.

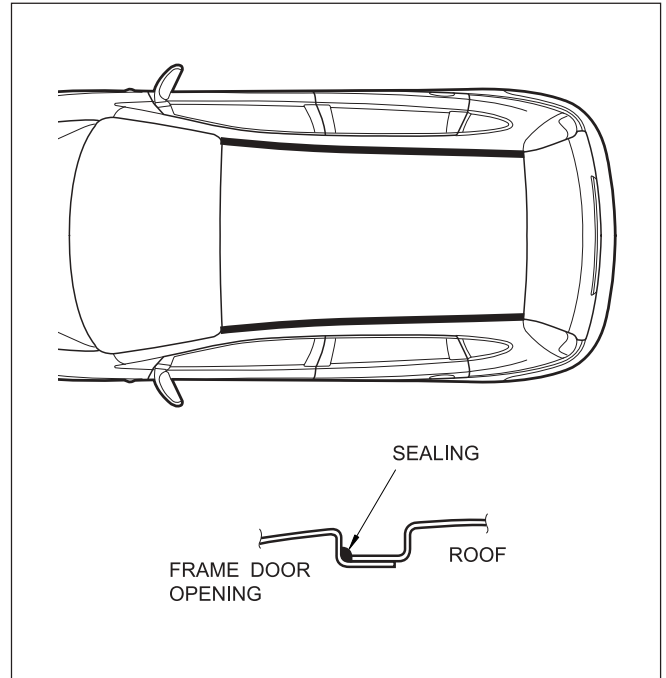


Fig. 7

11. Apply the paint.

**CAUTION**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.  
Read the paint label before opening paint container.
- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

12. Apply the deadner.

- Apply the deadner to the front inside of roof panel as shown.

13. Install the related parts.

- Windshield and rear glass.
- Cowl, wiper and related parts.
- Wiring harness and headlining.
- Pillar trims, door weatherstrip and others.
- Install in the reverse order in which they were removed.

14. Check and adjust.

- Clean the passenger compartment.
- Check the windshield and rear glass for water leaks.
- Check the room lamp and other all operation.

## 2. BACK PANEL

### 2-1. GENERAL DESCRIPTION

The back panel is joined to the side panel outer, rear extension longitudinal and extension rear floor. It forms the base for the rear combination lamps and other parts and maintains the rigidity of the rear body. Pay particular attention to twists and parallelism and check mounting of related parts when welding.

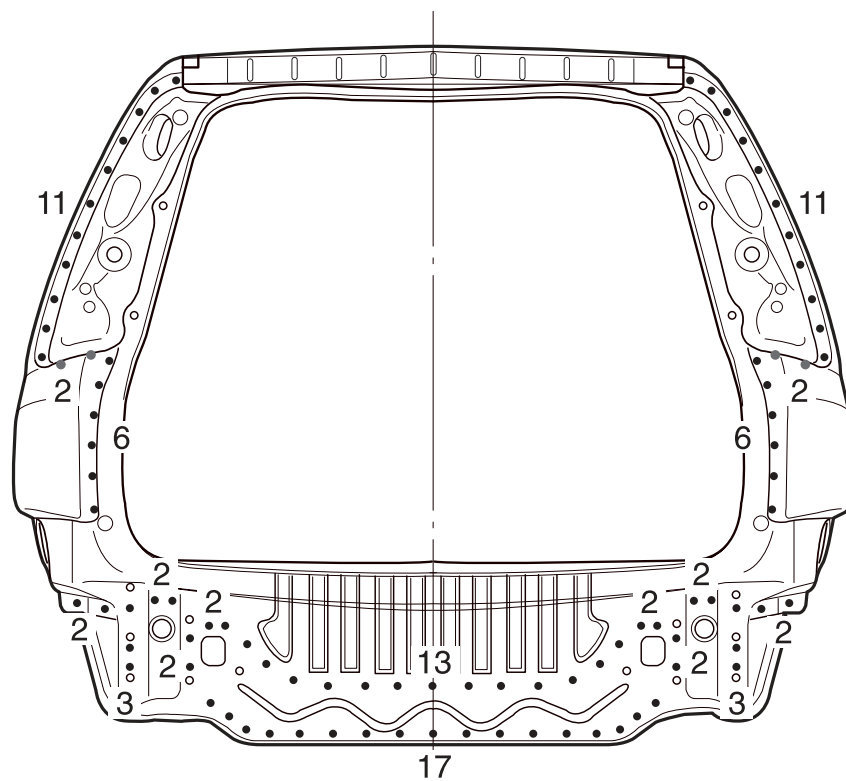


Fig. 8 Back Panel Welding Assembly

## 2-2. REPAIR PROCEDURE

### 1. Remove the related parts.

- Rear and trunk trims.
- Trunk lid lock and related parts.
- Rear combination lamps and wiring harness.
- Rear bumper and related parts.
- Other related parts.

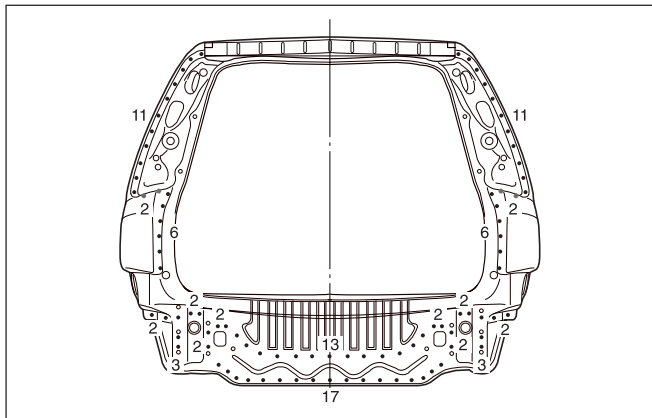


Fig. 9

### 2. Roughly pull out and straighten the damaged area.

- Check the damage and roughly pull out and repair the related side panel inner, rear floor, rear longitudinal and other damaged parts with the frame straightener before removing the back panel.
- Attach the car to the frame straightener by tightening the underbody clamps located at the jack up designated points on the bottom of the frame door opening.

### 3. Cut and pry off the rear panel.

- Center punch around the spot weld imprints with the rear side outer and extension rear floor panel.
- Use the special spot cutter to drill holes at the spot weld nuggets on the rear side outer and extension rear floor panel.

**NOTE:** When drilling holes be careful not to drill down to the side outer and extension rear floor panel themselves.

- Cut off the rear panel with an air chisel, leaving the welding flanges intact.

- Level and finish the burrs from the fried off spot welds with disc sander and repair all cracks, holes or other defects by welding also repair the floor panel if necessary.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

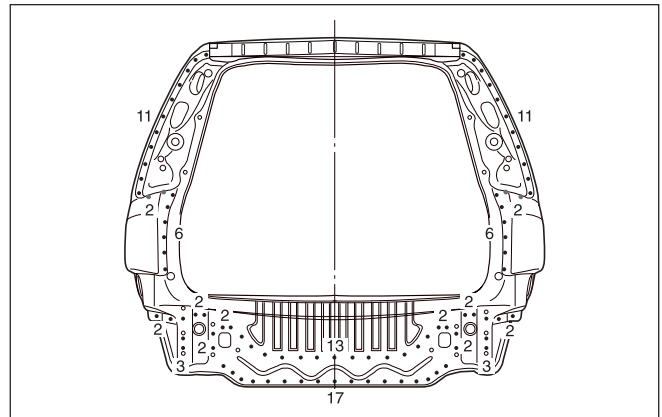


Fig. 10

### NOTE:

- If damage has occurred only on one side, cut the damaged section of the rear panel, trim the new panel to fit the remaining section, then butt weld both parts at the inner ends.
- Where damage has not extended into the rear side outer panel, cut the rear panel from the body on either panel.

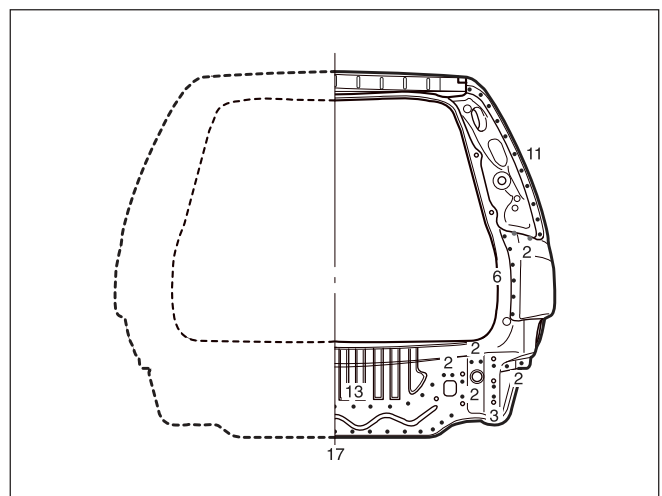


Fig. 11

4. Peel off the undercoat and sealer.

- Heat the undercoat and sealer at the welding areas of the rear side outer panel and extension rear floor with a gas torch and peel off the undercoat and sealer with a steel spatula.

5. Mold damaged related parts.

- Use a hammer and dolly to mold damaged areas of the rear side outer and extension rear floor panel.
- Even out the welding flanges with a hammer and dolly.
- Fill any holes drilled by welding.

6. Set the new rear panel.

- Grind both sides of the welding section of the rear panel with a sander to remove the paint and expose the steel plate.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Clamp both the right and left sides with the vise grips as shown.
- Weld the clamped sections for temporary installation.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

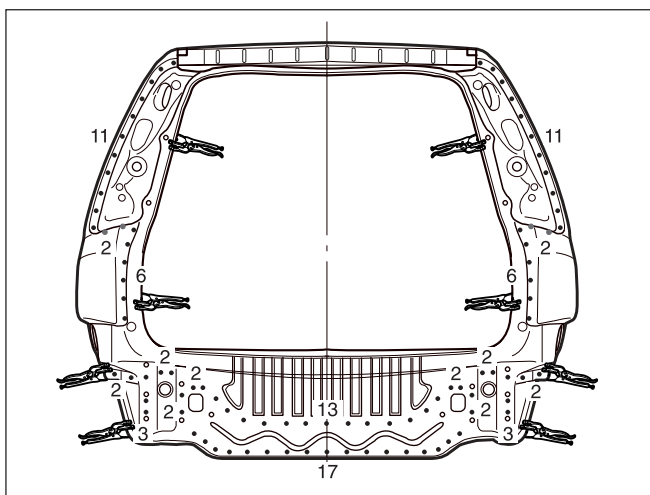


Fig. 12

7. Measure and check.

- Measure the trunk compartment diagonally to check it for twisting or bending and its correct position with the rear bumper installed.
- Temporarily assemble the rear combination lamps and trunk, then check the clearances and level differences.

8. Perform the main welding.

- Make MIG or gas welds at the butt joints.
- Spot weld the back panel as shown.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

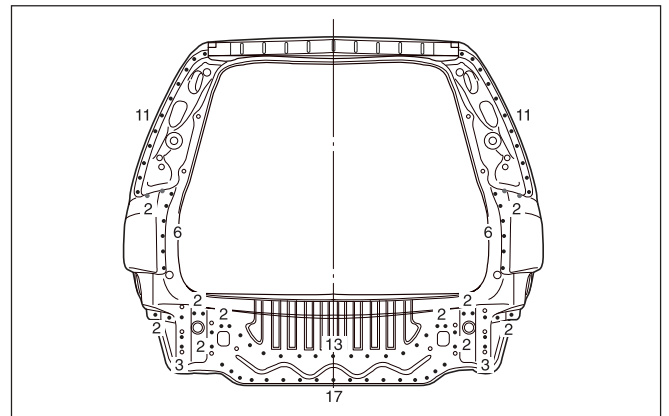


Fig. 13

9. Finish the welding areas.

- Level the gas or MIG welded areas with disc sander, then even out high areas with a hammer being careful not to deform them.
- Use a hammer and dolly to even out the rear side outer and extension rear floor panel flanges for a close fit with the surface of the rear panel.

10. Apply the sealer.

- Apply the sealer to the rear side outer joint and around the rear lamps areas of the rear panel.
- Apply the sealer to the extension rear floor panel and rear panel joint.

11. Apply the undercoat.

- Undercoat to the joint and overlapped areas of the rear floor under side.

12. Apply the paint.

**CAUTION**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.  
Read the paint label before opening paint container.
- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

13. Install the related parts.

- Clean the trunk compartment.
- Install in the reverse order in which they were removed.

14. Check and adjust.

- Check clearances and level differences.
- Check the trunk locking and unlocking condition.
- Check all operation.
- Check for water leaks in the trunk compartment.

**NOTE:** Use specified check sheet for operation check properly.

### 3. REAR FLOOR PANEL

#### 3-1. GENERAL DESCRIPTION

The rear floor panel is the base of the rear body and it is critical for the rigidity of the rear body. During replacement, refer to the body dimension chart or body repair chart and determine the position to set the rear floor properly.

Be sure that the rear floor is not bent or deformed. Weld securely to maintain the rigidity of the rear body.

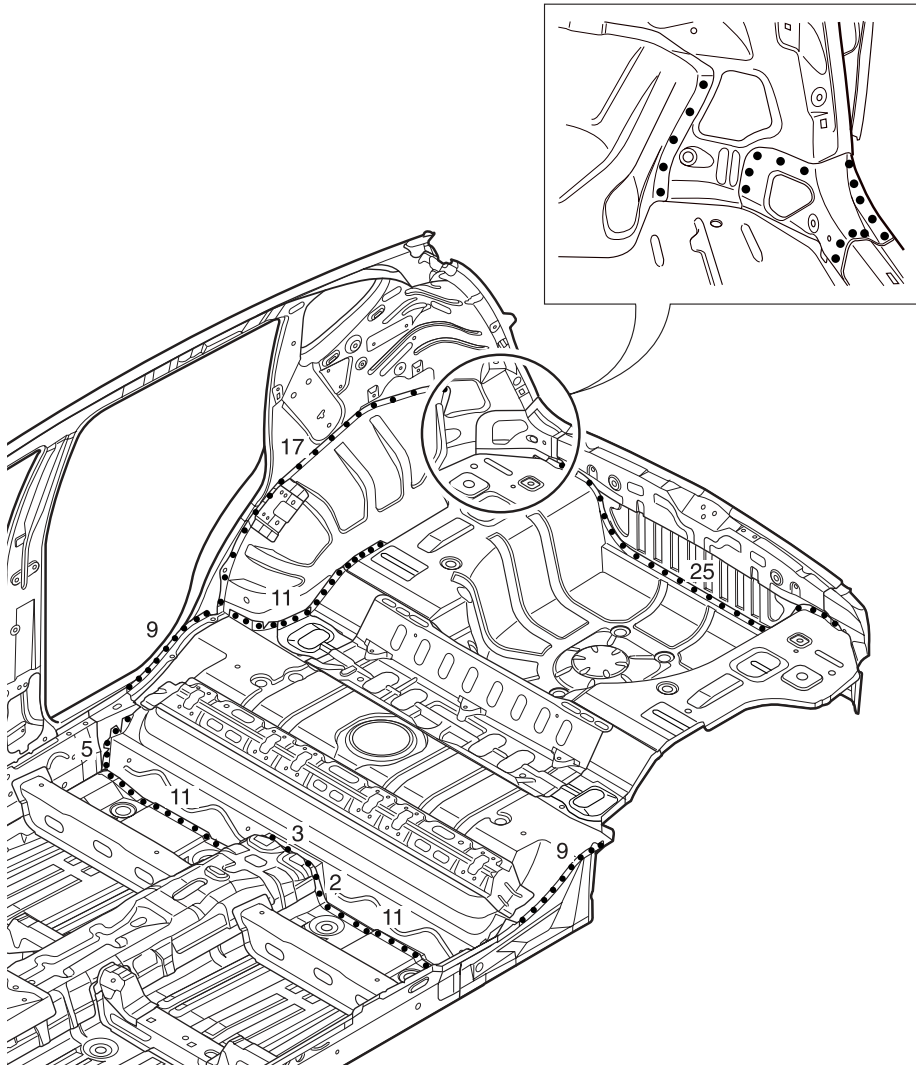


Fig. 14 Rear Floor Welding Assembly



### 3-2. REPAIR PROCEDURE

#### 1. Remove the related parts.

- Parts to be removed when removing the back panel.
- Rear seat belt and rear seat.
- Muffler, fuel tank and related parts.
- Chassis parts.
- Other related parts.

**CAUTION:** Do not smoke while working near the fuel system. Keep open flame away from the fuel system. If necessary, remove the fuel tank and off lines.

#### 2. Roughly pull out and straighten the damaged area.

- Check the damage and roughly pull out and repair the related back panel, side panel, wheel-house inner, rear longitudinal and other damaged parts with the frame straightener before removing the extension rear floor panel, rear floor panel and back panel.
- Attach the car to the frame straightener by tightening the underbody clamps located at the jack up designated points on the bottom of the frame door opening.

**NOTE:** Measure in reference to the dimensions on the body repair chart.

#### 3. Cut and pry off the back panel.

- The back panel to be cut and pried off when removing the back panel.

#### 4. Cut and pry off the rear floor and extension rear floor panel.

- Cut off the rear floor and extension rear floor with a gas torch or air chisel leaving the spot welded flanges of the rear longitudinal along the bold line in the figure below.

**NOTE:** Cut the rear floor 15mm(0.59in.) from welded flange of the cross member rear seat.

- Center punch around the spot weld imprints with the rear longitudinal, extension rear longitudinal and web plate.
- Use the special spot cutter to drill holes at the spot weld nuggets on the center punched areas.

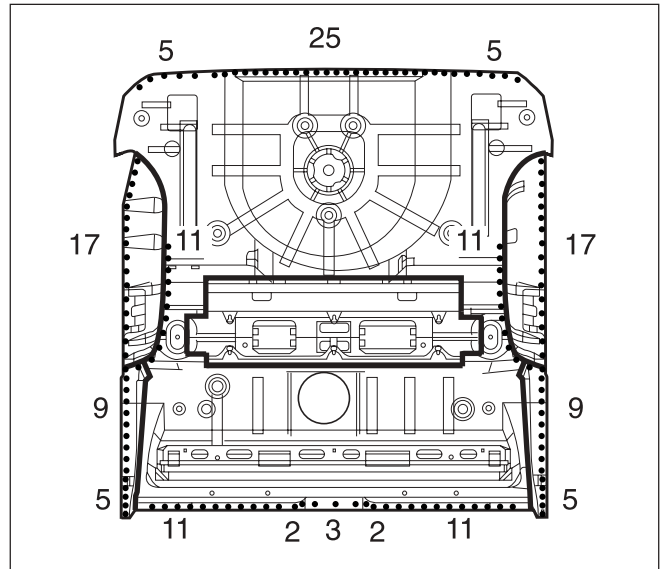


Fig. 15

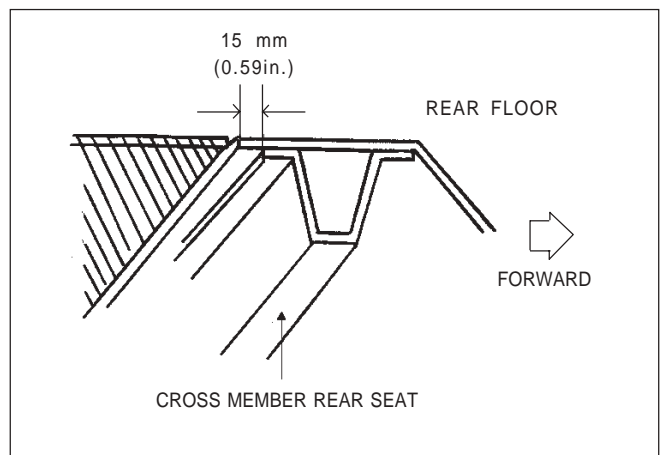


Fig. 16

**NOTE:** When drilling holes be careful not to drill down to the rear longitudinal, extension rear longitudinal and web plate themselves.

- Cut and pry off the remaining rear floor and extension rear floor panel with an air chisel, leaving the welding flanges intact.
- Level and finish the burrs from the pried off spot welds with disc sander and repair all cracks, holes or other defects by welding also repair the rear longitudinal and extension rear longitudinal if necessary.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

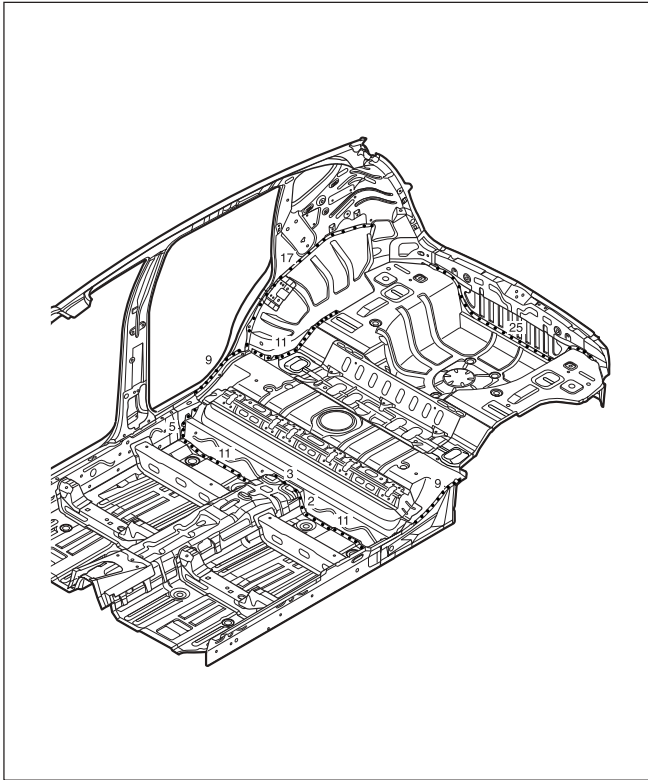


Fig. 17

5. Peel off the undercoat and sealer.

- Heat the undercoat and sealer at the welding areas with a gas torch and peel off the undercoat and sealer with a steel spatula.

6. Mold damaged related parts.

- Use a hammer and dolly to mold damaged areas of the rear longitudinal and extension rear longitudinal.
- Even out the welding flanges with a hammer and dolly.
- Fill any holes drilled by welding.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Level and finish the burrs from the pried off spot welds with disc sander.
- Sand off the paint and undercoat from both sides of the flange to be welded.

7. Cut the new rear floor to align it with the body, then set the new rear floor and extension rear floor.

- Cut the new part so it overlaps the cross member rear seat by approximately 40mm.

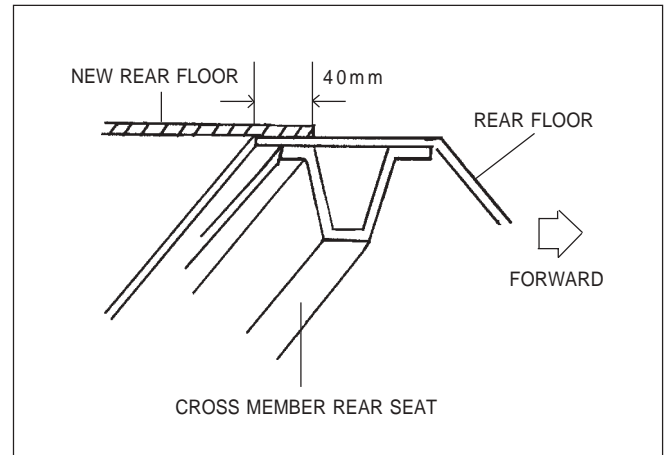


Fig. 18

- Grind both sides of the welding section of the rear floor and extension rear floor with a disk sander to remove the paint and expose the steel plate.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Set and clamp the new panel in place with the vise grips.

**NOTE:** Use of jigs is recommended for correct positions and check that the both rear longitudinal is parallel.

- Tack weld the clamped section for temporary installation.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Remove the vise grips and temporarily install the rear panel, then check the alignment, level differences and outer appearance.

# 8. Remove the main welding.

- Weld the rear floor and cross member rear seat with a MIG welder fillet weldings as shown.

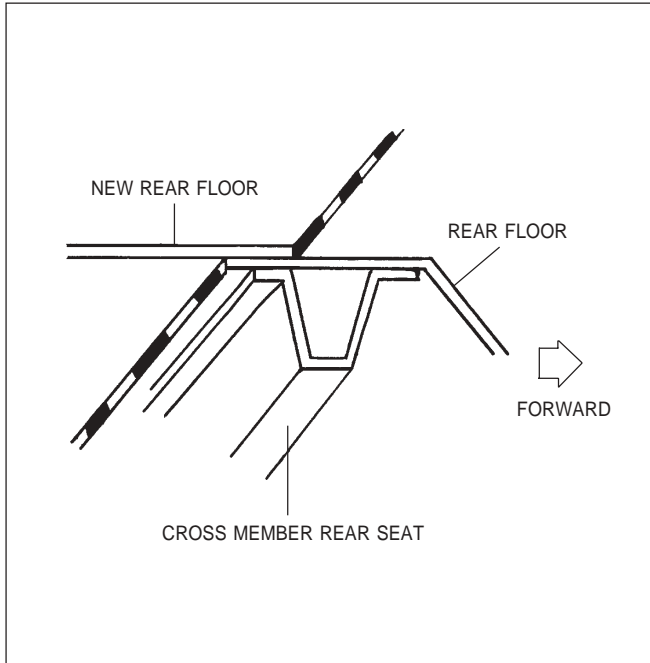


Fig. 19

- Spot weld the rear floor and extension rear floor with rear longitudinal flange areas and web plate flanges as shown.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

# 9. Weld the back panel

- The back panel to be welded when replacement the back panel.

# 10. Finish the welding area.

- Level the MIG welded areas with a disc sander, then even out high areas with a hammer being careful not to deform them.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever standing, cutting, or grinding.

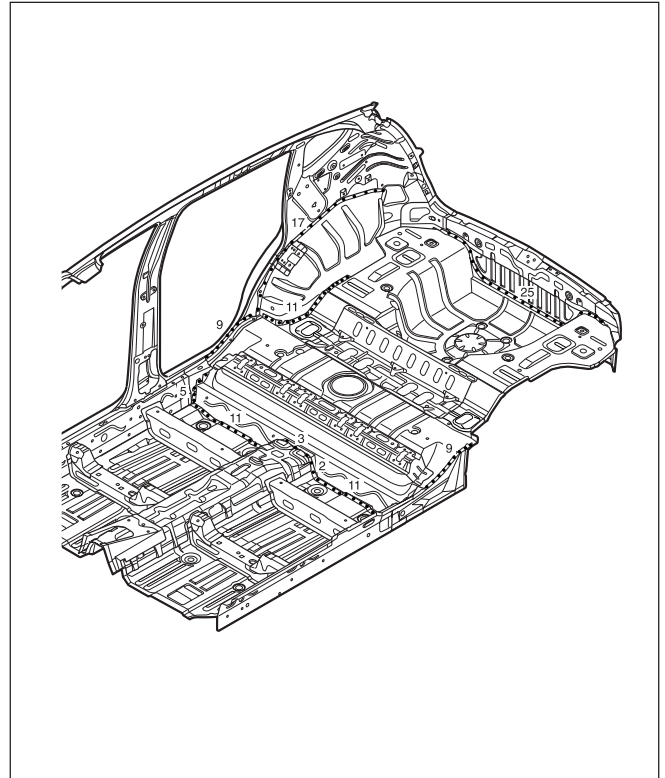


Fig. 20

- Use a hammer and dolly to even out the spot welded areas for a close fill the flange surface together.

# 11. Apply the sealer.

- Apply the sealer at the overlapped areas of the rear floor and extension rear floor, and welded surfaces of the matching panel and all sealing gaps completely.

# 12. Apply the undercoat.

- Undercoat to the rear wheelhouse and designated rear floor.

# 13. Apply the paint

## CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

#### 14. Apply the deadner.

- Clean the passenger and trunk compartment.
- Apply the deadner to the surface of rear floor and extension rear floor.

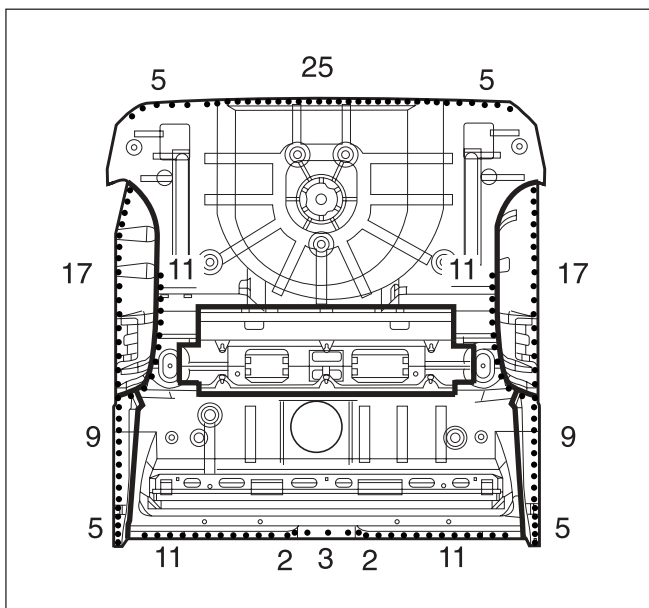


Fig. 21

#### 15. Install the related parts.

- Install in the reverse order in which they were removed.

#### 16. Check and adjust

- Check clearances and level differences.
- Check the trunk locking and unlocking condition.
- Check all operation.
- Check for water leaks in the trunk compartment.

**NOTE:** Use specified check sheet for operation check properly.

## SECTION 6

# FRAME DOOR OPENING, DOOR AND SIDE PANEL OUTER

## CONTENTS

<b>1. FRAME DOOR OPENING .....</b>	<b>6-2</b>
• General description .....	6-2
• Repair procedure .....	6-3
<b>2. DOOR .....</b>	<b>6-6</b>
• Repair procedure .....	6-6
<b>3. SIDE PANEL OUTER .....</b>	<b>6-8</b>
• General description .....	6-8
• Repair procedure .....	6-9

## 1. FRAME DOOR OPENING

### 1-1. GENERAL DESCRIPTION

The frame door opening consist of frame door area and side outer area. It forms the base for the front, rear doors and other parts and maintains the rigidity of the doors and roof. The frame door opening area should, depending on the degree of damage, be repaired as much as possible rather than repalced.(Repair by pulling out)

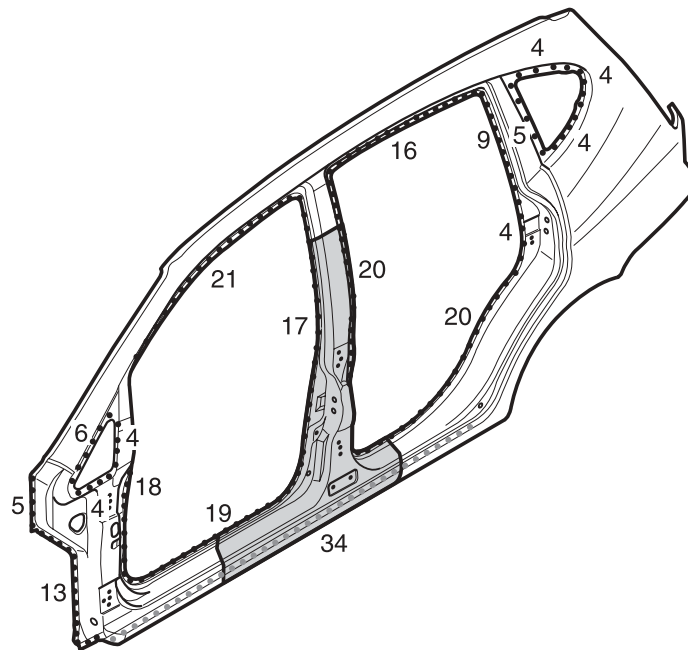


Fig. 1 Frame Door Opening Welding Assembly

## 1-2. REPAIR PROCEDURE

### 1. Remove the related parts.

- Doors.
- Weather strips, pillar trims and related parts.
- Carpet.
- Seat belt assembly
- Door switch and wiring harness.
- Fuel pipe and brake oil pipe.
- Other related parts.

**NOTE:** Remove according to part damaged.

### 2. Pull out and straighten the damaged area to approximately the original shape.

- Damage may extend to the inner roof frame, the inner frame door opening and the floor. Determine the extent of the damage first, so the frame can be pulled out properly.

**NOTE:** Use heat-resistant protective cover for protect painting areas, seats, carpets and other parts.

- Pull out and straighten the damaged areas.
- Do not pull out more than necessary.

### 3. Cut and pry off the frame door opening.

- Check the damage on the frame door opening, then cut the new frame door opening so it will overlap by 30mm in the pillar, front and rear.
- Cut the damaged area with a hand saw along the bold line as shown.

**NOTE:** Be careful not to cut the inner panel. This could result in extensive repair.

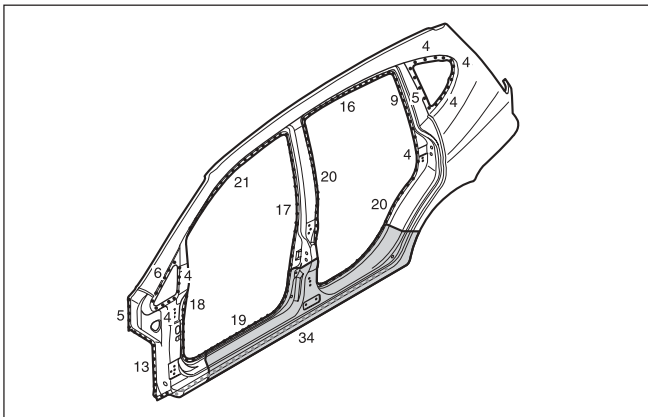


Fig. 2

- If the damage involves part of the center pillar, cut them as shown.

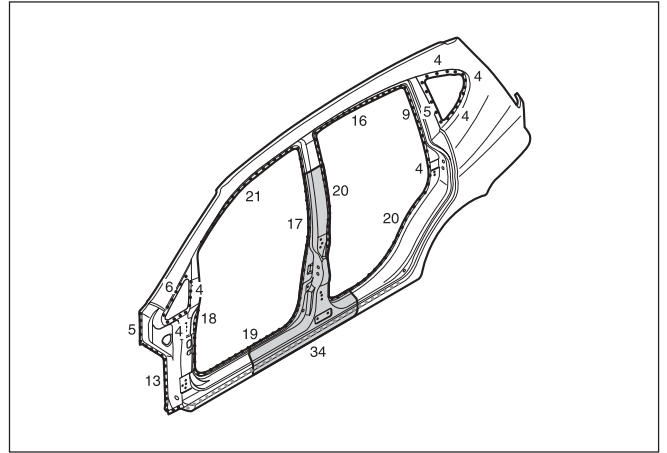


Fig. 3

- Center punch around the spot weld imprints on the welded flange.
- Use the special spot cutter to drill holes at the spot weld nuggets.

**NOTE:** When drilling holes be careful not to drill down to the inner panel.

- Pry off the frame door opening panel with an air chisel, leaving the welding flanges intact.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

### 4. Mold damaged related parts.

- Fill any holes drilled by welding.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Use a hammer and dolly to mold damaged areas of the remaining inner panel and even out the welding flanges.
- Level and finish the burrs from the pried off spot welds with disc sander.
- Sand off the paint and undercoat from both sides of the flange to be welded.

## 5. Set the new frame door opening.

- Grind both sides of the welding section of the prepared frame door opening part with a disk sander to remove the paint and expose the steel plate.
- Clamp the new panel in place with the vise grips.
- Tack weld the clamped section for temporary installation.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

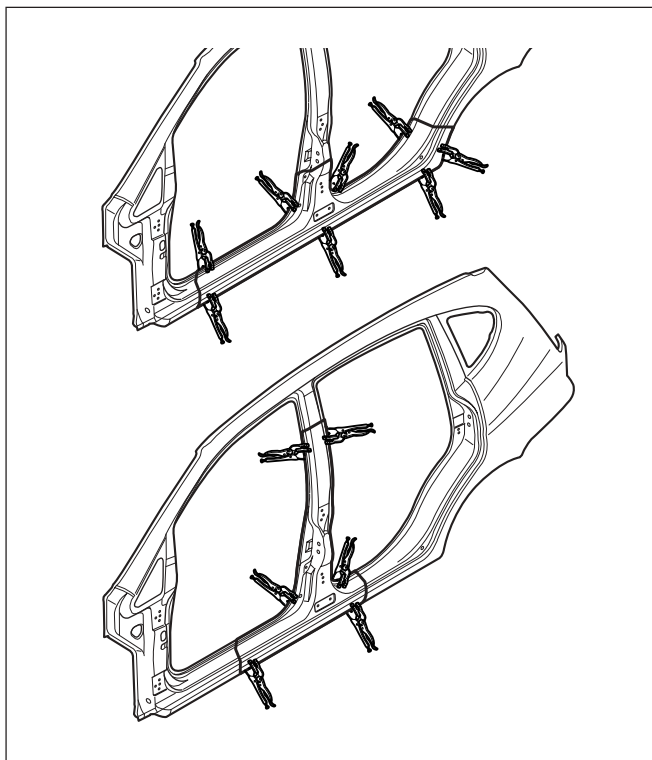


Fig. 4

- Remove the vise grips and temporarily install the fender and doors, then check the clearances, level differences and outer appearance.

## 6. Perform the main welding.

- Weld the front, rear frame door opening and center pillar at the butt joints with a gas or MIG welder.
- Spot weld the frame door opening and center pillar as shown.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

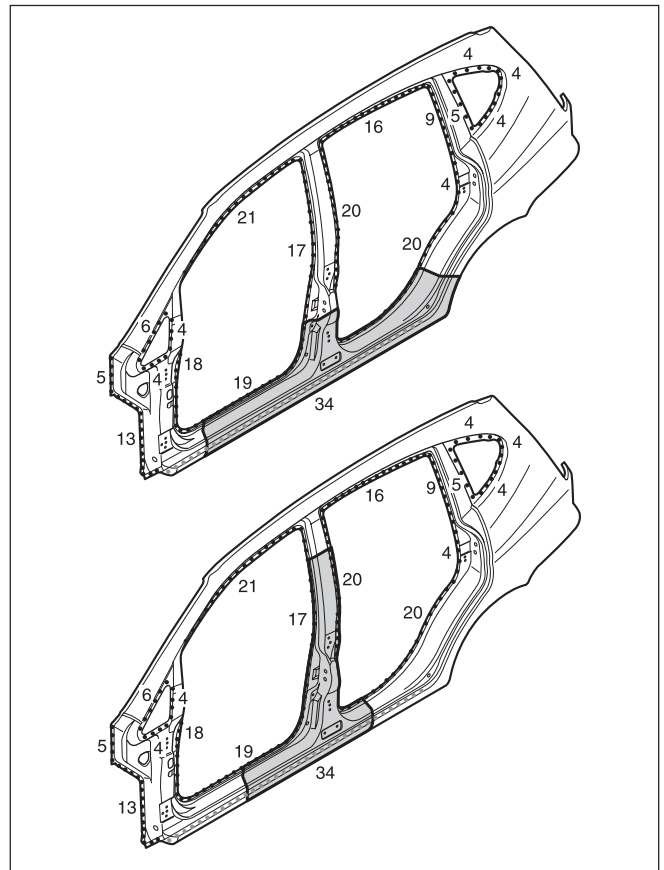


Fig. 5

## 7. Finish the welding areas.

- Level the gas or MIG welded areas with a disc sander, then even out high areas with a hammer being careful not to deform them.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Use a hammer and dolly to even out the spot welded flanges for a close fit with the surface of the frame door opening panel.
- Fill in deformations and level differences of the welded areas with solder or putty, then finish.

## 8. Apply the sealer.

- Apply the sealer to the matching surfaces of the floor and frame door opening.



## 9. Apply the undercoat.

- Undercoat to the front floor.

## 10. Apply the paint.

**CAUTION**

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

## 11. Coating the anti-rust agents.

- Coating the anti-rust agents to the inside of frame door opening areas sufficiently.

## 12. Install the related parts.

- Clean the passenger compartment.
- Wiring harness and related parts.
- Seat belt assembly and carpet.
- Trims and weather strips.
- Door and others.
- Install in the reverse order in which they were removed.

## 13. Check and adjust.

- Check clearances and level differences.
- Check the door locking and unlocking condition.
- Check for water leaks in the passenger compartment.

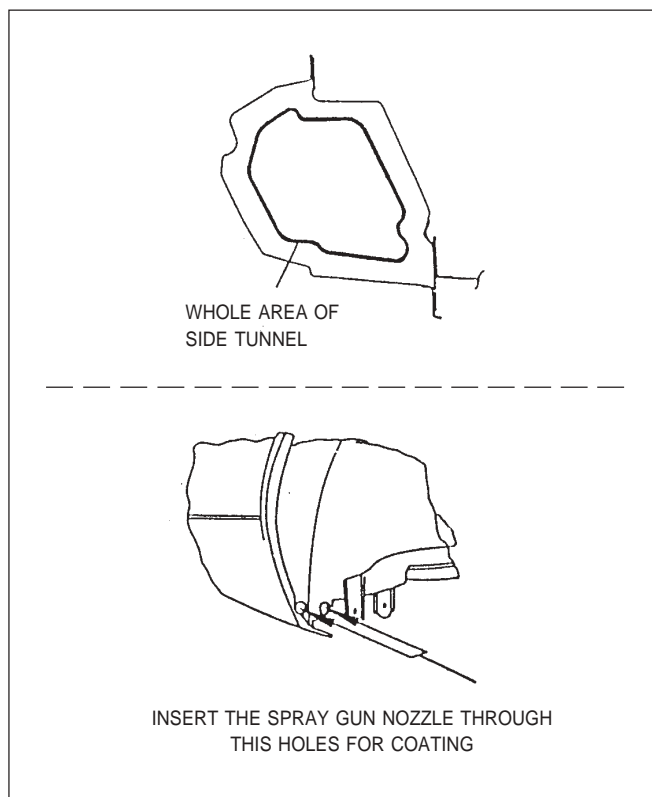


Fig. 6

## 2. DOOR

### 2-1. REPAIR PROCEDURE

1. Remove the related parts.
  - Door trim and related parts.
  - Wiring harness and solenoid valve.
  - Glass and window lifter.
  - Linkage, lock set and handle.
  - Others.

**NOTE:** Inspection and choose the usable parts.

2. Remove the door.
  - Remove the bolt from door check hinge(1) and remove the four bolts from door assembly(2).

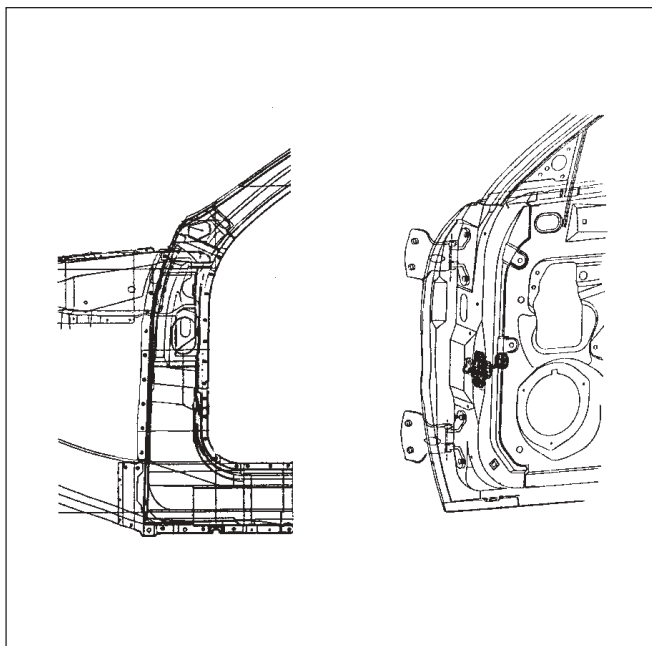


Fig. 7

3. Preparation of the new door.
  - Preparation of the new door and check damaged areas.
4. Preinstall the door.
  - Fix the four bolts.

- Check and adjust the clearances and level differences of doors, fender, pillar, roof and side panel outers.

- Check any deformation.

5. Remove the new door.
  - Remove the four bolts from door assembly.
6. Apply the paint.

#### CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.  
Read the paint label before opening paint container.
- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

8. Coating the anti-rust agents.
  - Coating the anti-rust agents to the inside of bottom areas.

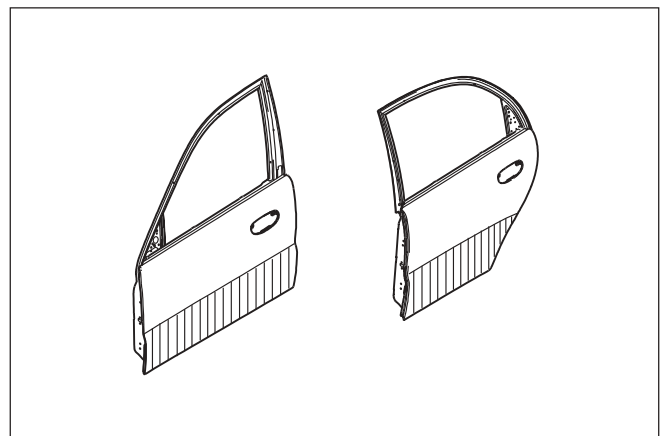


Fig. 8

9. Install the door.

- Install the door with four bolts.
- Install the door check link set in the door and fix the bolt.
- Check clearances and level differences.

10. Install the related parts.

- Handle, linkage and lock set.
- Glass and window lifter.
- Solenoid valve and wiring harness.
- Install door trim and others.

**NOTE:** Before install the door trim and related parts, rub in grease to the moving parts and check all operation.

11. Check and adjust.

- Check clearance and level differences.
- Check the door locking and unlocking condition.
- Check for water leaks in the passenger compartment.

### 3. SIDE PANEL OUTER

#### 3-1. GENERAL DESCRIPTION

The side panel outer consists of side outer area and frame door area. The side outer area is a conspicuous part of the outer appearance of the vehicle. It is especially important for the body line continuing from door. Therefore, pay particular attention to it when conducting work. This part must be aligned with the rear door, trunk lid, rear glass and other parts.

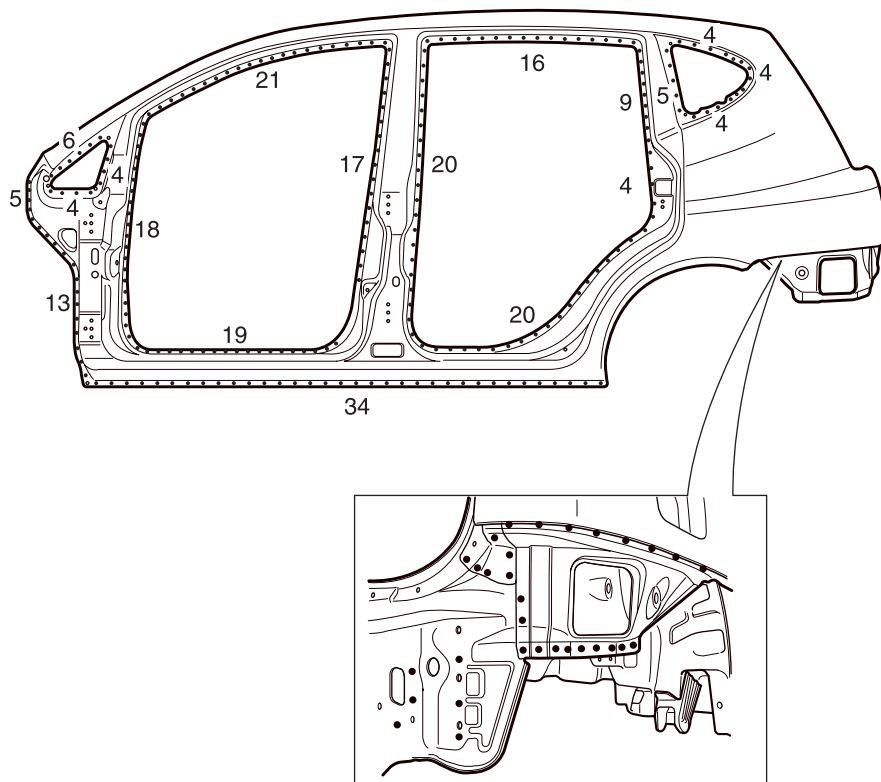


Fig. 9 Side Panel Outer Welding Assembly

### 3-2. REPAIR PROCEDURE

#### 1. Remove the related parts.

- Rear and trunk trims.
- Rear combination lamps and wiring harness.
- Rear bumper and related parts.
- Rear seat and rear seat belt.
- Chassis and fuel parts.
- Other related parts.

**CAUTION:** Do not smoke while working near the fuel system. Keep open flame away from the fuel system. If necessary, remove the fuel tank and off lines.

#### 2. Pull out and straighten the damaged area to approximately the original shape.

- Attach the car to the frame straightener by tightening the underbody clamps at the four designated support points.
- Before cutting off the damaged sections, pull them out so that they are restored to the original shape.
- Do not pull out more than necessary.
- Pull out and straighten the damaged areas of the rear side outer panel, side inner panel and wheelhouse inner.

**NOTE:** Check the rear door locking and unlocking condition.

#### 3. Cut and pry off the side panel outer.

- Cut at the rear pillar and side outer(rear side of frame door opening) along the bold lines as shown with a handsaw and snips carefully.
- Center punch around the spot weld imprints with the rear panel, side panel inner and arch area.
- Use the special spot cutter to drill holes at the spot weld nuggets on the rear side outer panel.

**NOTE:** When drilling holes be careful not to drill down to the side panel inner and rear panel themselves.

- Cut the panel from the body with an air chisel, leaving the welding flanges at the side inner panel, wheelhouse inner and back panel intact.
- Level and finish the burrs from the pried off spot welds with a hammer, dolly and disc sander.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

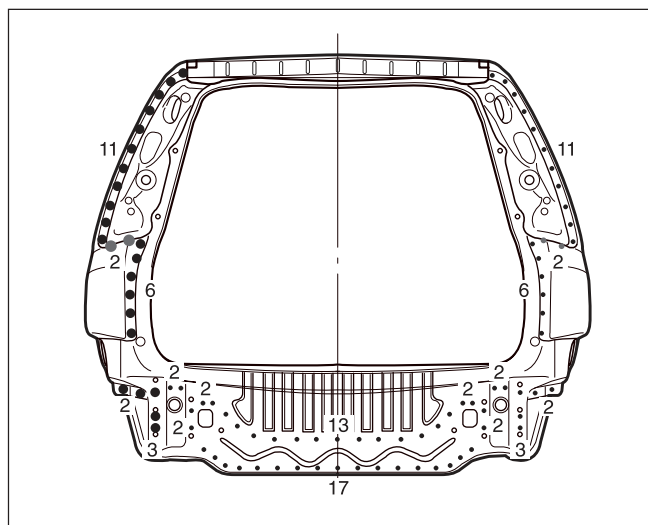


Fig. 10

#### 4. Mold damaged related parts.

- Fill any holes drilled by welding.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Use a hammer and dolly to mold damaged areas of the remaining inner panel and even out the welding flanges.
- Sand off the paint and undercoat from both sides of the flange to be welded.

#### 5. Set the new side panel outer.

- Cut the new side panel outer so it will overlap by 30mm in the frame door opening area with a hand saw.

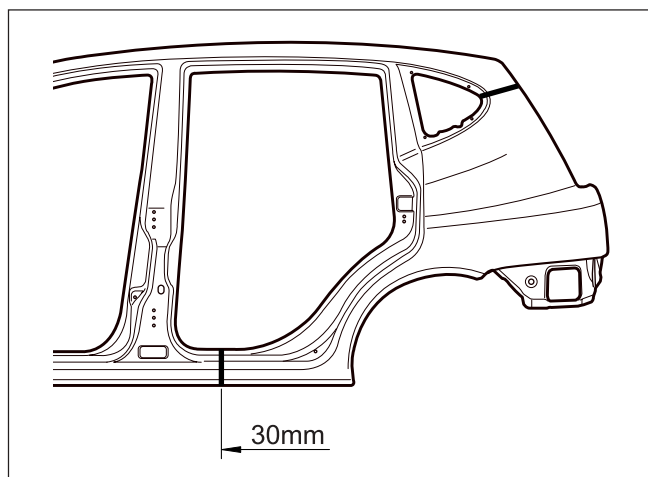


Fig. 11

- Grind both sides of the welding section of the prepared side panel outer with a disk sander to remove the paint and expose the steel plate.
- Clamp the new panel in place with the vise grips.
- Tack weld the clamped section for temporary installation.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Remove the vise grips and temporarily install the trunk lid and doors, then check the clearances, level differences and outer appearance.

6. Perform the main welding.

- Weld the frame door opening area and pillar at the butt joints with a gas or MIG welder.
- Spot weld the flanges and wheel arch of the side panel outer as shown.

**CAUTION:** To prevent eye injury and burns when welding, wear an approved welding helmet, gloves and safety shoes.

- Perform a trial welding first, and check the welding condition.
- Increase the number of spot by 20% for areas to be spot welded.

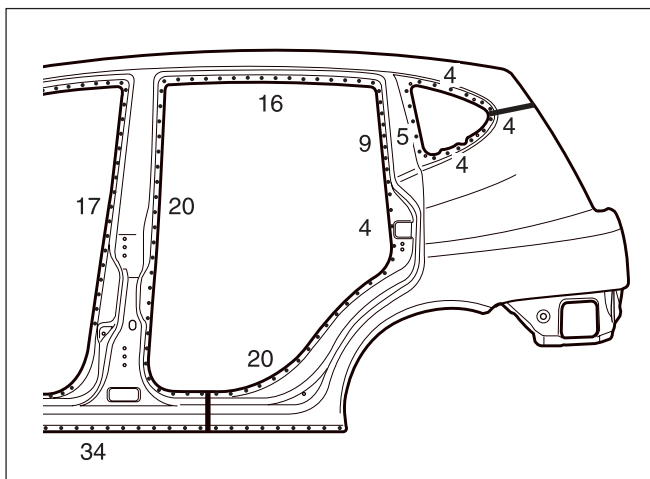


Fig. 12

7. Finish the welding areas.

- Level the gas or MIG welded areas with a disc sander, then even out high areas with a hammer being careful not to deform them.

**CAUTION:** To prevent eye injury, wear goggles or safety glasses whenever sanding, cutting, or grinding.

- Use a hammer and dolly to even out the spot welded flanges for a close fit with the surface of the side panel outer.
- Fill in deformations and level differences of the welded areas with solder or putty, then finish.

8. Apply the sealer.

- Apply the sealer to the matching surfaces of the web plate, back panel lower, rear combination lamp area and side panel outer.

9. Apply the undercoat.

- Undercoat to the rear wheelhouse and designated rear floor.

10. Apply the paint.

## CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

### 11.Coating the anti-rust agents.

- Coating the anti-rust agents to the inside of frame door opening areas sufficiently.

12. Apply the deadner.

- Apply the deadner to the inside of side panel outer center.(Left side only)

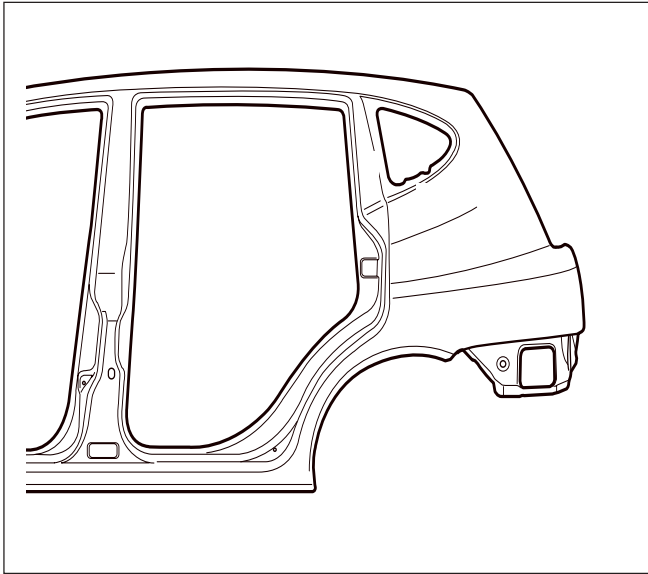


Fig. 13

13. Install the related parts.

- Clean the passengers compartment.
- Wiring harness and related parts.
- Seat belt assembly and carpet.
- Trims and weather strips.
- Door and others.
- Install in the reverse order in which they were removed.

14. Check and adjust.

- Check clearances and level differences.
- Check the door locking and unlocking condition.
- Check for water leaks in the passenger compartment.

**SECTION 7**

**FENDER, HOOD AND TRUNK LID**

**CONTENTS**

**1. FENDER ..... 7-2**

- Repair procedure ..... 7-2

**2. HOOD ..... 7-4**

- Repair procedure ..... 7-4

**3. TRUNK LID ..... 7-6**

- Repair procedure ..... 7-6



## 1. FENDER

### 1-1. REPAIR PROCEDURE

1. Remove the related parts.
  - Radiator grill and front bumper.
  - Mud guard and fender liner.
2. Remove the fender
3. Preparation of the new fender.
  - Preparation of the new fender and check damaged areas.
4. Apply the paint.

#### CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed. Read the paint label before opening paint container.
- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

5. Coating the anti-rust agents.

- Coating the anti-rust agents to door hinge areas.

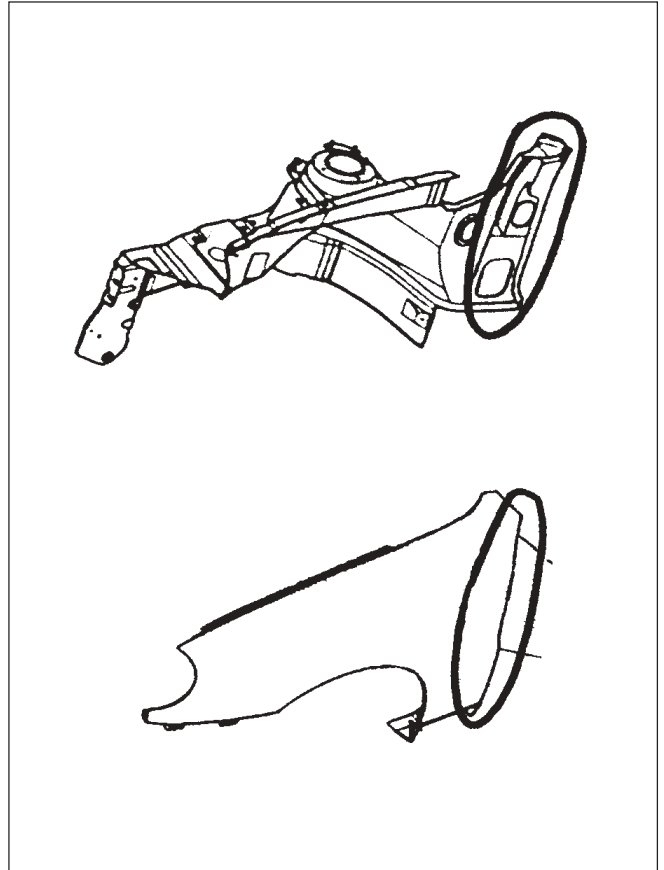


Fig. 2

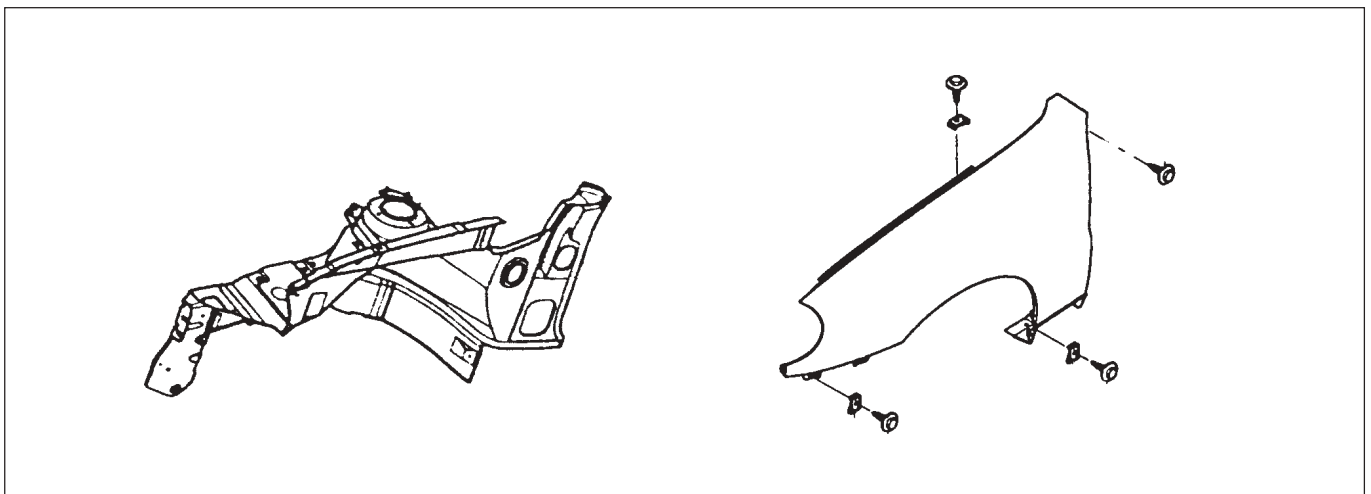


Fig. 1

## 6. Apply the mastic sealer.

- Apply the mastic sealer to the mounting bolts.

**NOTE:** Before apply the new sealer, check the current sealer status.

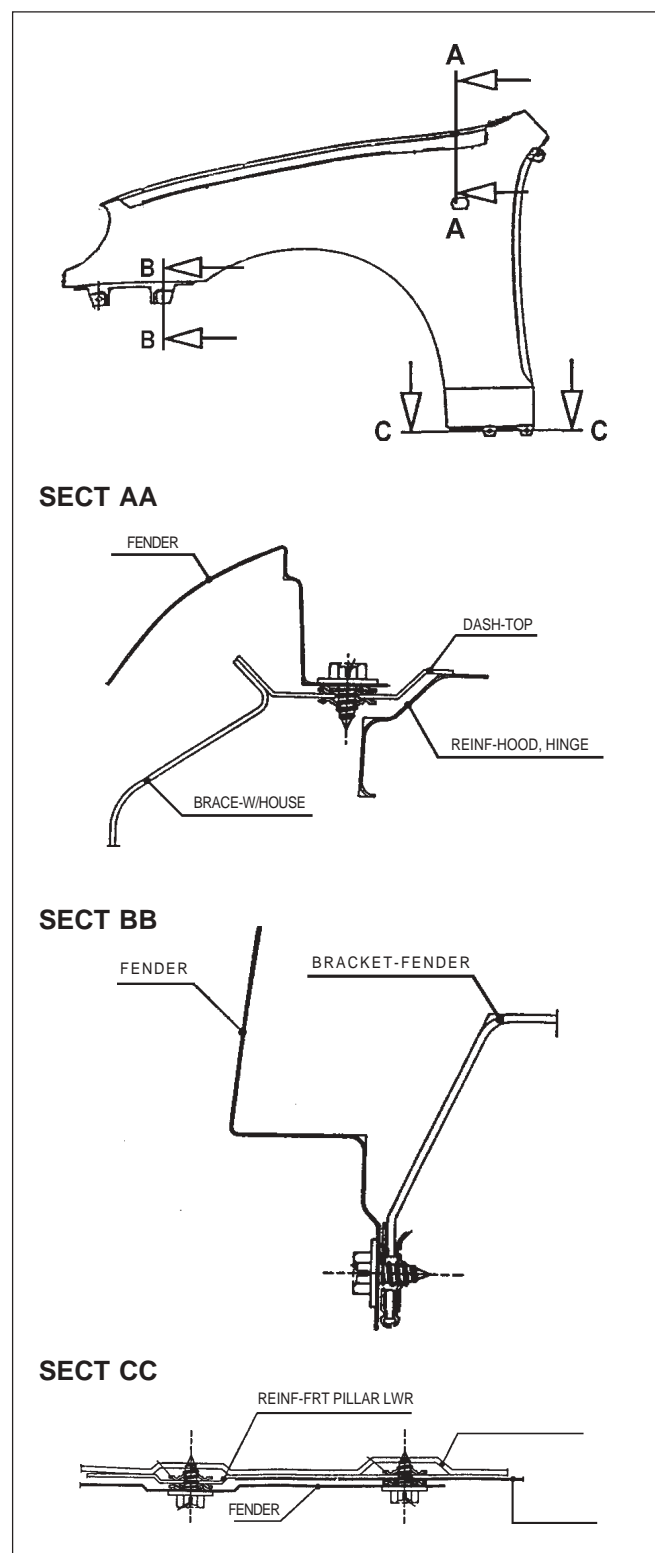


Fig. 3

## 7. Preinstall the fender.

- Fasten to the wheelhouse at two places with bolts. Close the hood and check the front and rear clearances and level differences of the hood and door.

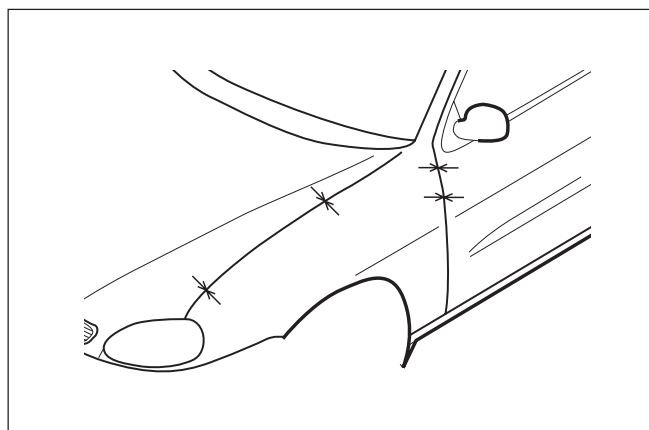


Fig. 4

## 8. Tighten fully.

- After checking and adjusting the mounting position, tighten all bolts fully.

## 9. Install the related parts.

- Install in the reverse order in which they were removed.

## 10. Check clearance

- Check clearance of front bumper.

## 2. HOOD

### 2-1. REPAIR PROCEDURE

1. Remove the related parts.
  - Washer hose and nozzles.
  - Wiring harness and others.
2. Remove the hood.
  - Remove the hood mounting bolts from two hinge bows.

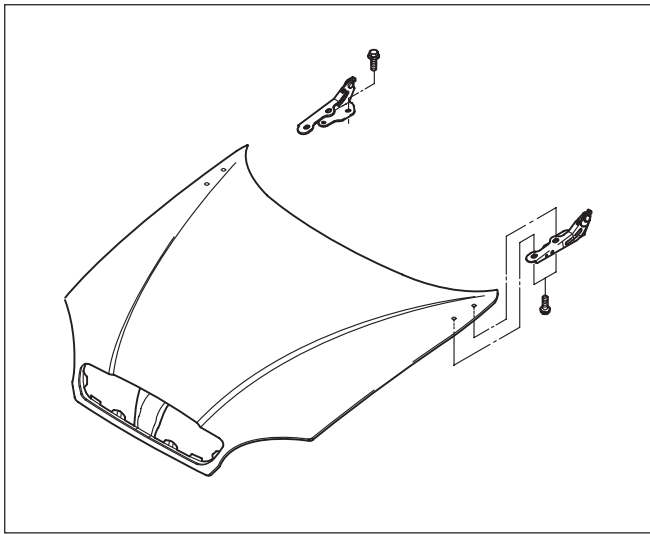


Fig. 5

3. Preparation of the new hood.
  - Preparation of the new hood and check damaged areas.

4. Apply the paint.

#### CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

5. Preinstall the hood.

- Fasten to the hood hinges bows at two places with four bolts, carefully.

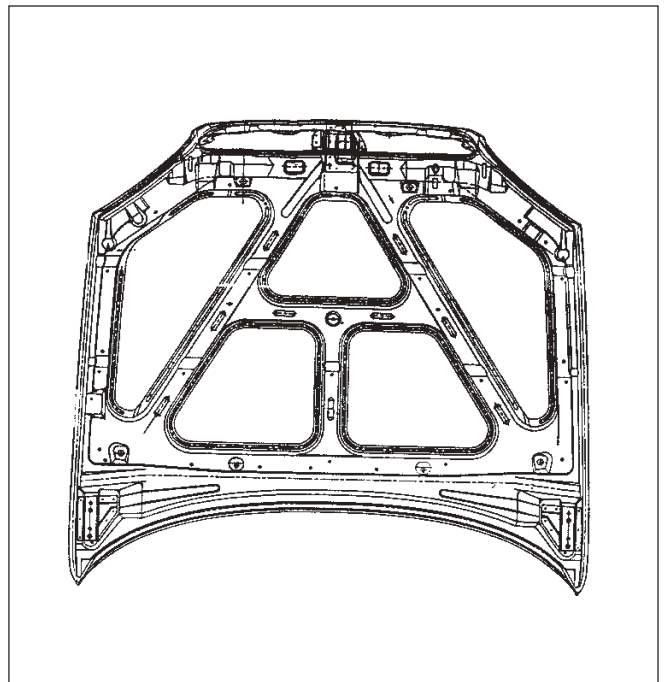


Fig. 6

- Close the hood and check the front and rear clearances and level difference of hood, fender and head lamps.

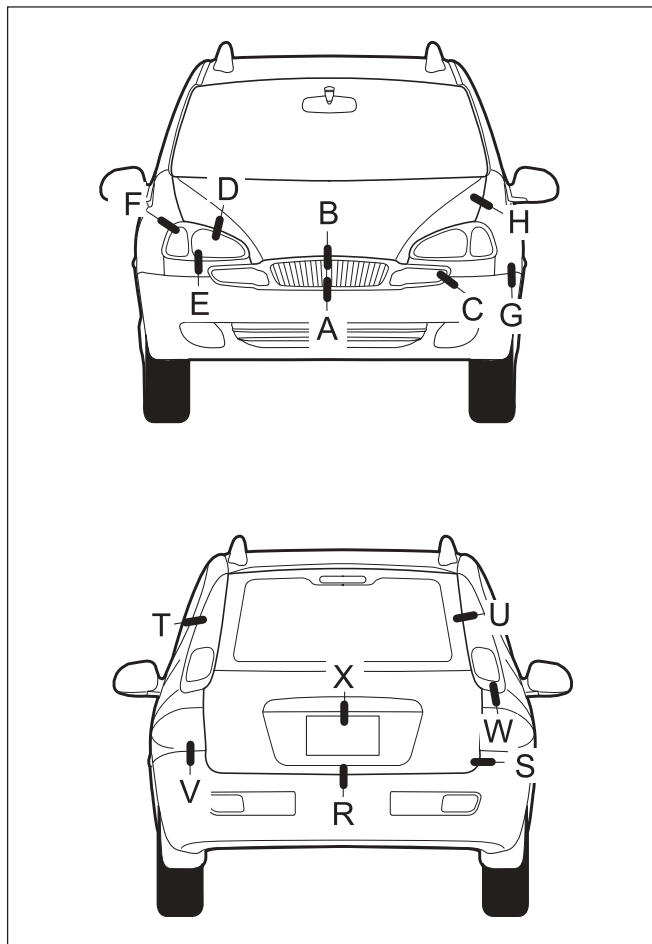


Fig. 7

6. Tighten fully.
  - After checking and adjusting the mounting position, tighten all bolts fully.

7. Install the related parts.

- Washer hose and nozzles.
- Install in the reverse order in which they were removed.

8. Check and adjust.

- Check clearances and level differences.
- Check the hood locking and unlocking condition.
- Check spray conditions of washer liquid and adjust washer spray nozzles on the hood panel.

## 3. TRUNK LID

### 3-1. REPAIR PROCEDURE

1. Remove the related parts.
  - Wiring harness and solenoid valve.
  - Lock set, latch set and others.
2. Remove the trunk lid.
  - Remove the trunk lid mounting bolts from two hinge bows.

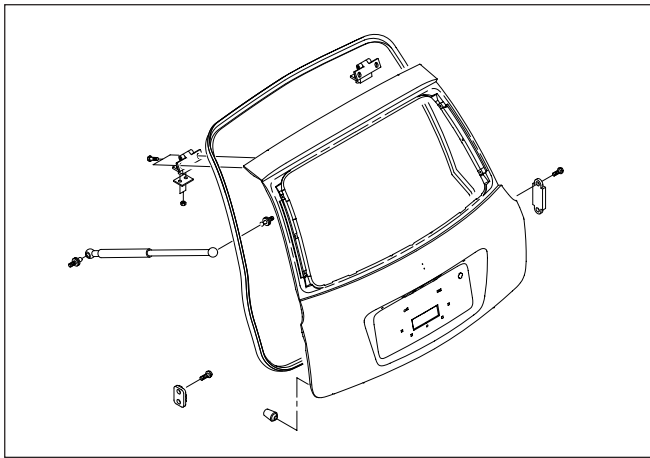


Fig. 8

3. Preparation of the new trunk lid.
  - Preparation of the new trunk lid and check damaged areas.

4. Apply the paint.

#### CAUTION

- Ventilate when spraying paint. Most paint contains substances that are harmful if inhaled or swallowed.

Read the paint label before opening paint container.

- Avoid contact with skin. Wear an approved respirator, gloves, eye protection and appropriate clothing when painting.
- Paint is flammable. Store in a safe place, and keep it away from sparks, flames or cigarettes.

5. Preinstall the trunk lid.

- Fasten to the trunk lid hinges bows at two places with four bolts, carefully.
- Install bumper.

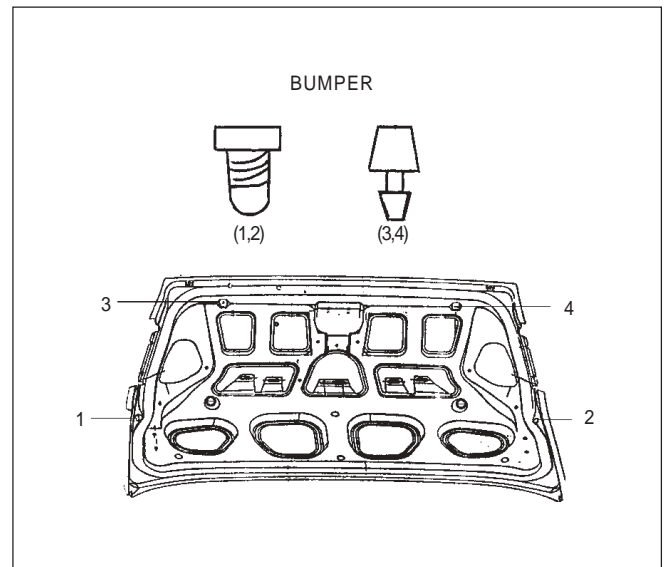


Fig. 9

- Close the trunk lid and check the clearances and level difference of trunk lid, side panel outers and rear combination lamps.

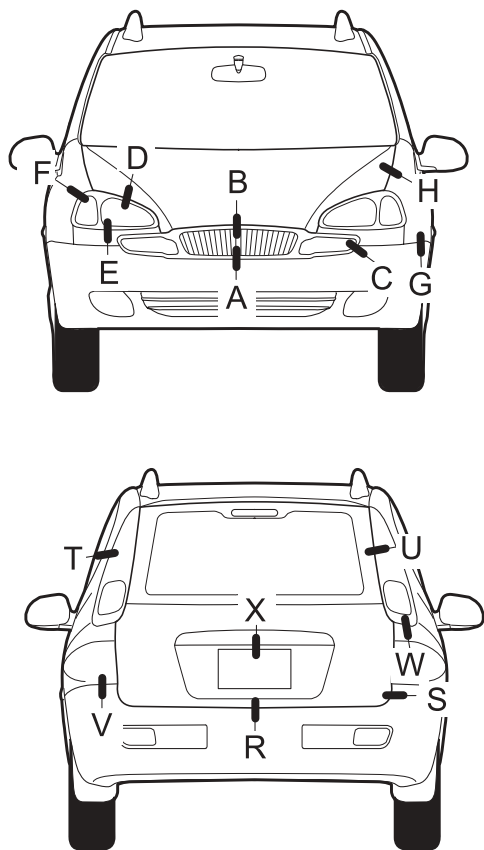


Fig. 10

6. Tighten fully.
  - After checking and adjusting the mounting position, tighten all bolts fully.
7. Install the related parts.
  - Wiring harness and solenoid valve.
  - Lock set, latches and linkages.
  - Install in the reverse order in which they were removed.
8. Check and adjust.
  - Clean the trunk compartment.
  - Check clearances and level differences.
  - Check the trunk lid locking and unlocking condition.
  - Check for water leaks in the trunk compartment.

**SECTION 8**

**BODY DIMENSION**

**CONTENTS**

**1. BODY DRAWING ..... 8-2**

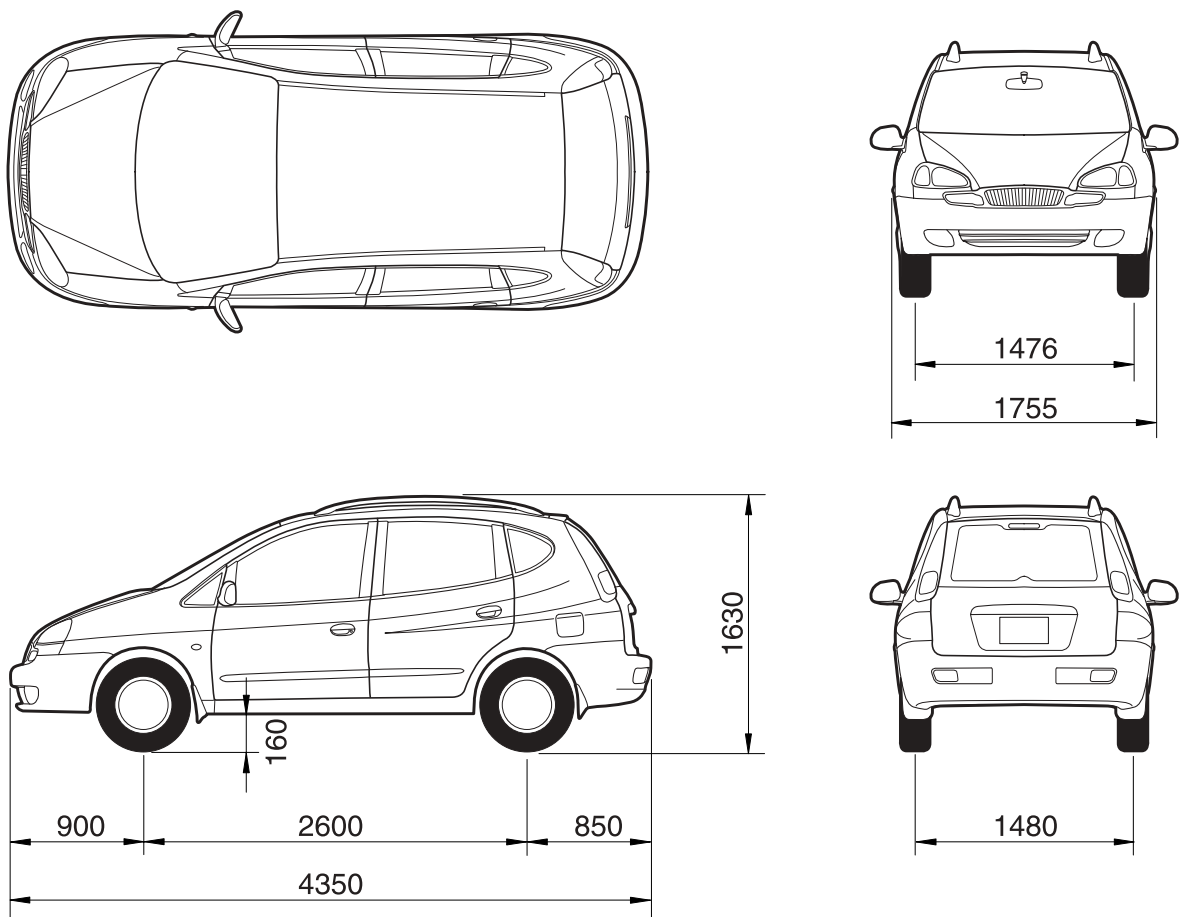
- Under Body ..... 8-3
- Front Frame ..... 8-4
- Rear Frame ..... 8-5
- Front Panel ..... 8-6
- Engine Room ..... 8-7
- Side Outer ..... 8-10

**2. BODY WELDING DIAGRAM ..... 8-11**

- Front Panel Upper ..... 8-11
- Front Wheel House ..... 8-12
- Brace Wheel House ..... 8-13
- Dash Panel Upper ..... 8-14
- Dash Panel Lower ..... 8-15
- Roof ..... 8-17
- Body Side and Wheel House Inner ..... 8-18
- Rear Frame ..... 8-19
- Tail Gate ..... 8-20

**3. GAP CHART ..... 8-21**

1. BODY DRAWING



Front wheel alignment	
Camber	-20' ± 45'
Caster	3°
Toe-in(2-person load)	0 ± 10'

Rear wheel alignment	
Camber	-1°45' ± 30
Toe-in(2-person load)	5' ± 30'

Fig. 1



1-1. UNDER BODY

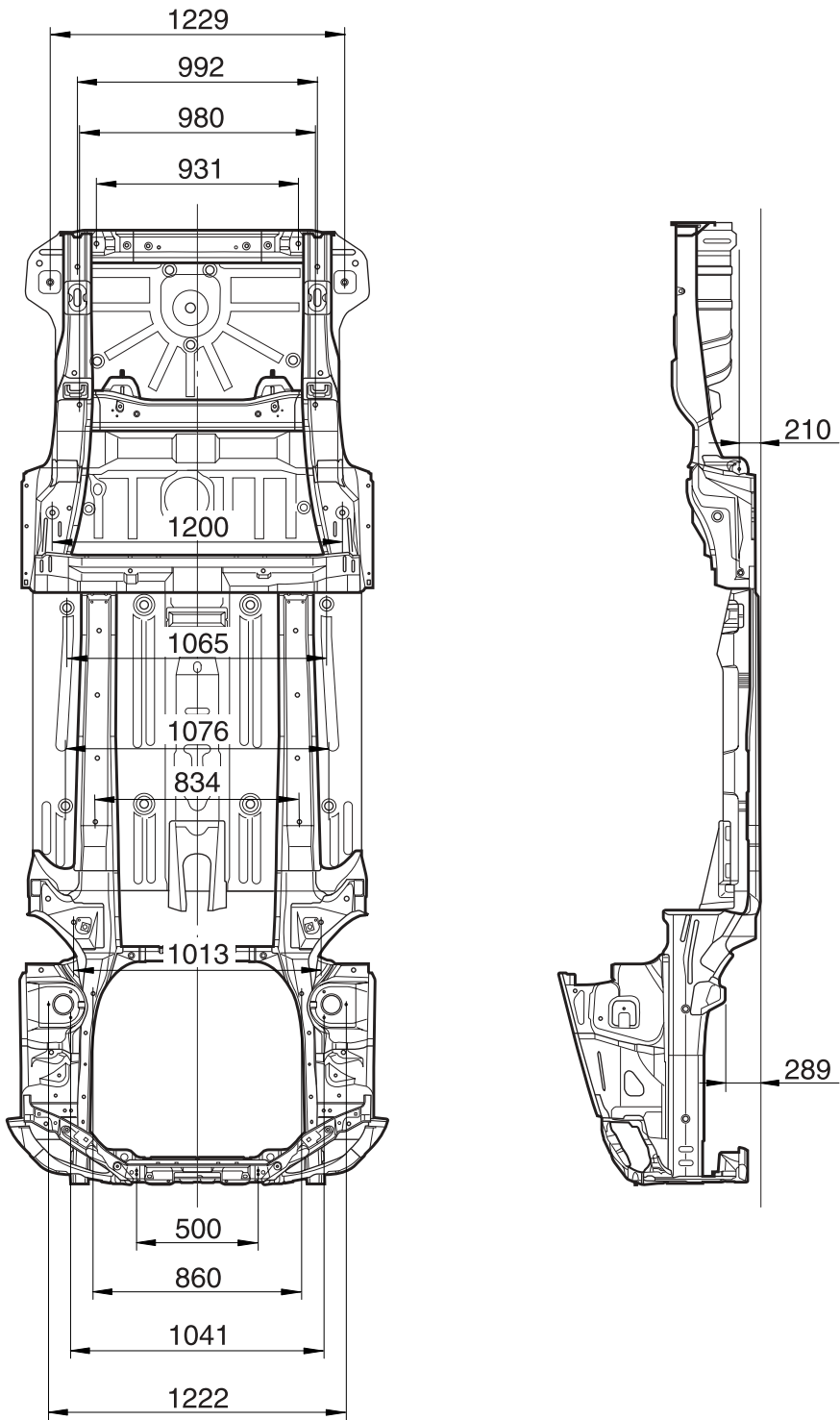


Fig. 2

1-2. FRONT FRAME

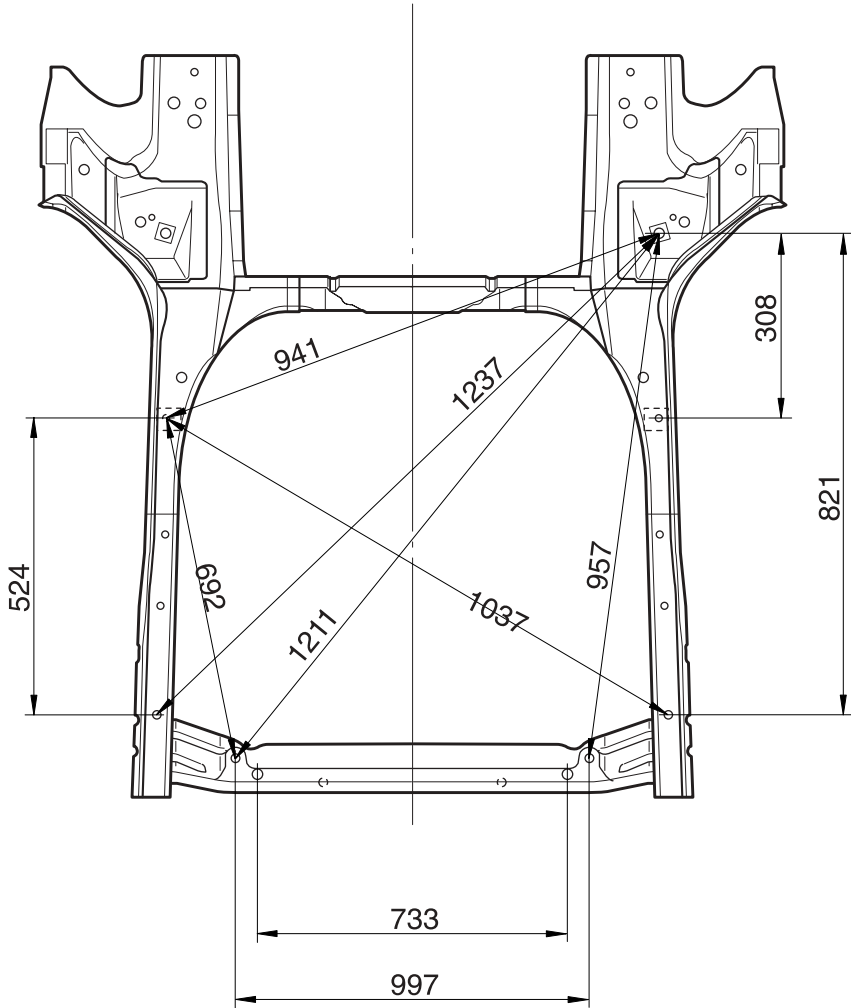


Fig. 3

1-3. REAR FRAME

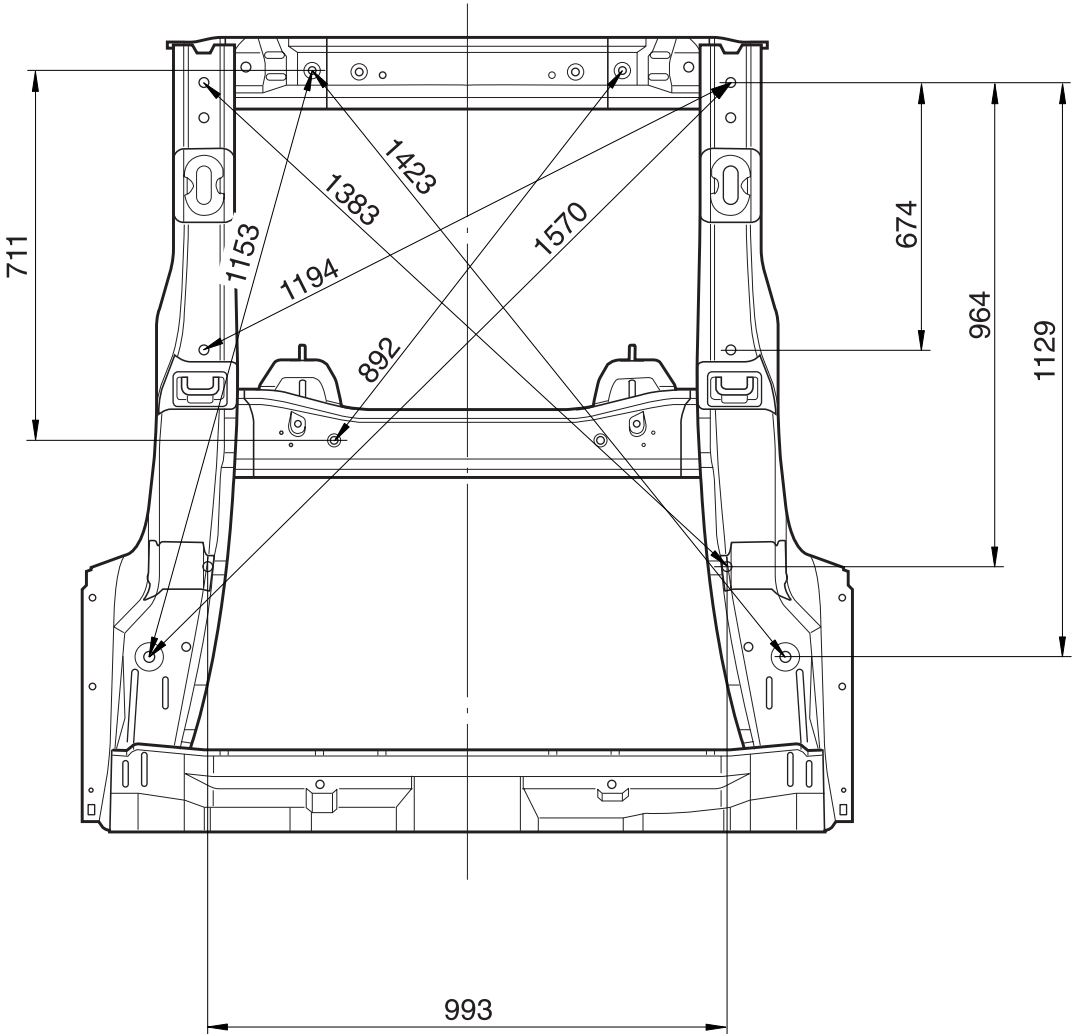


Fig. 4

1-4. FRONT PANEL

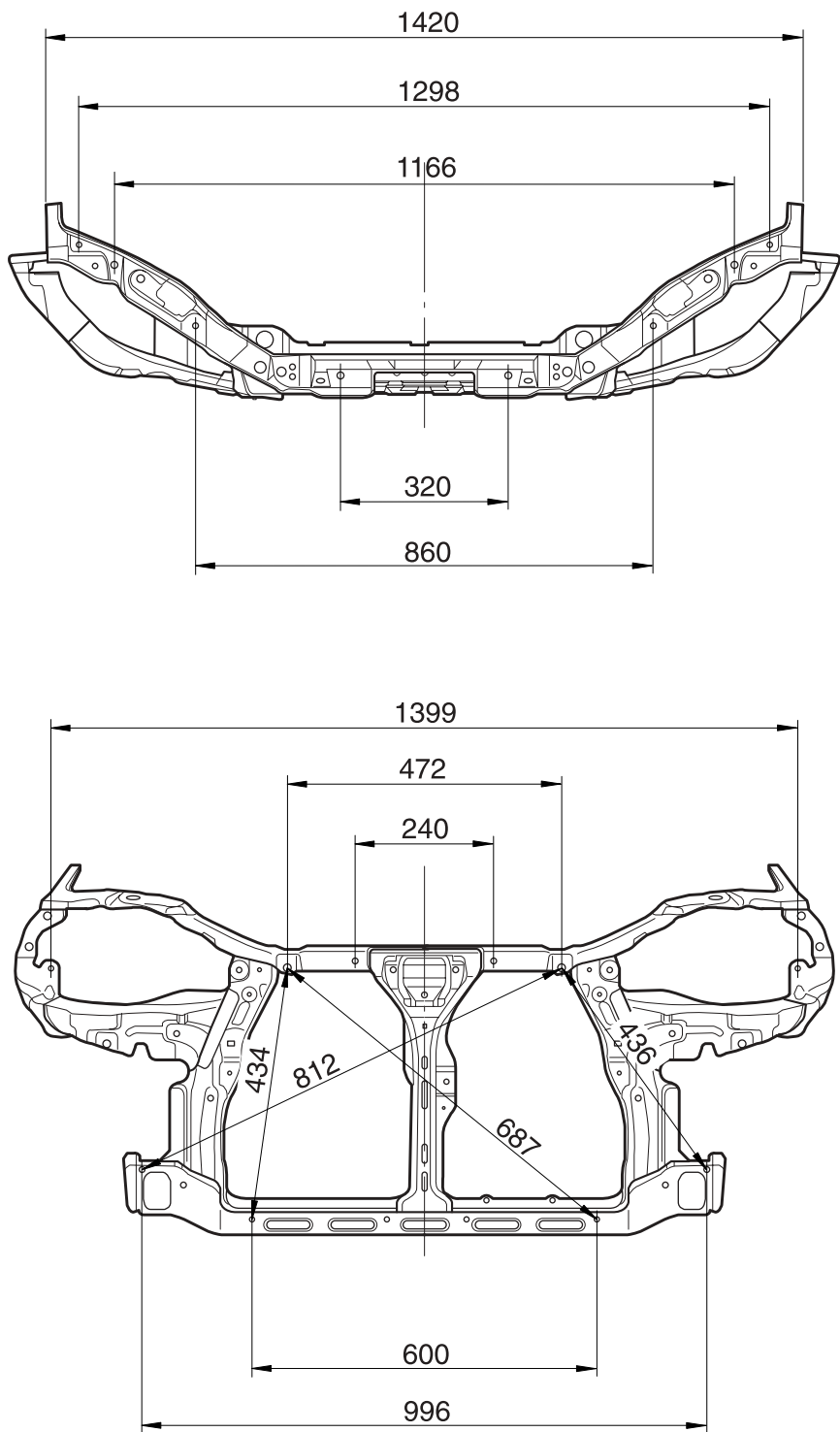


Fig. 5

1-5. ENGINE ROOM

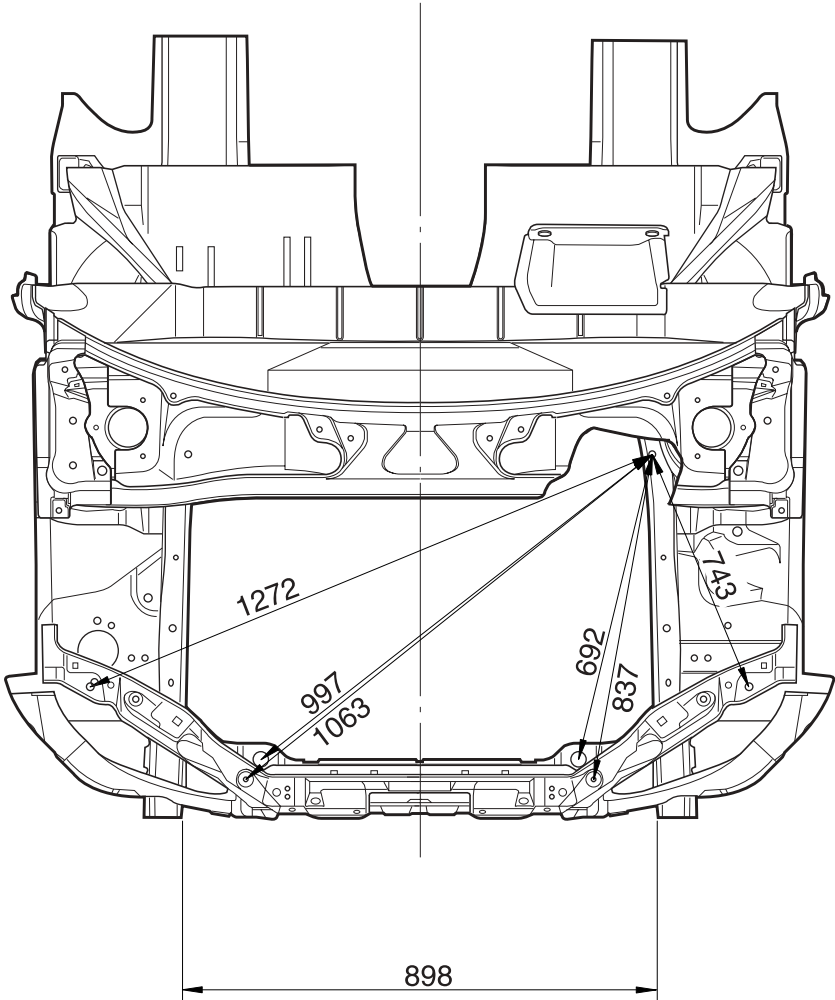


Fig. 6

ENGINE ROOM(Continued)

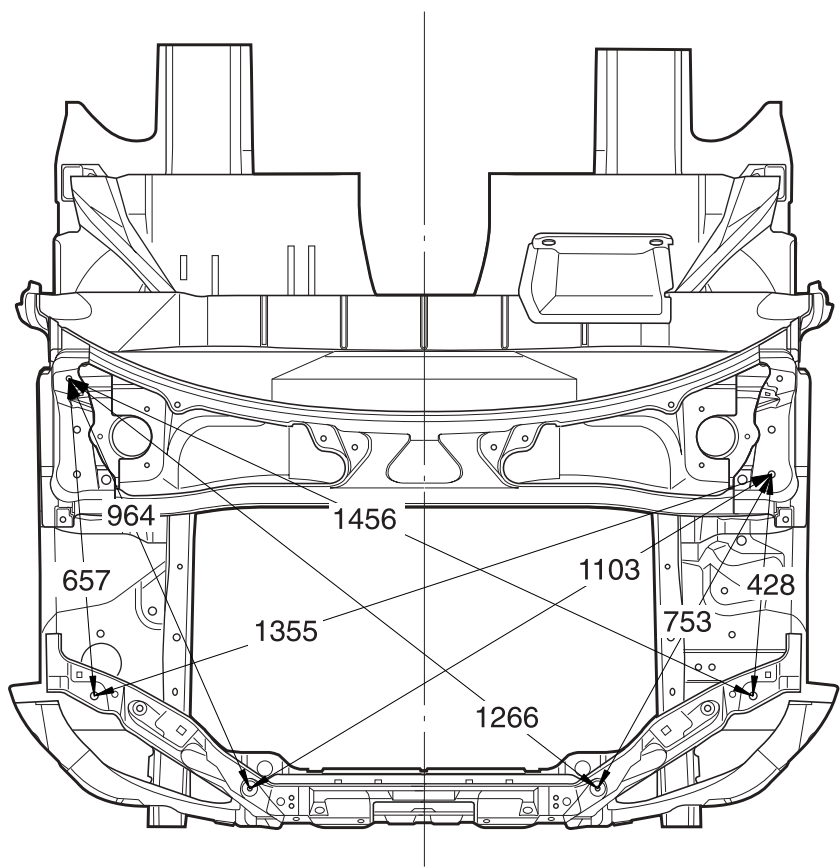


Fig. 7

ENGINE ROOM(Continued)

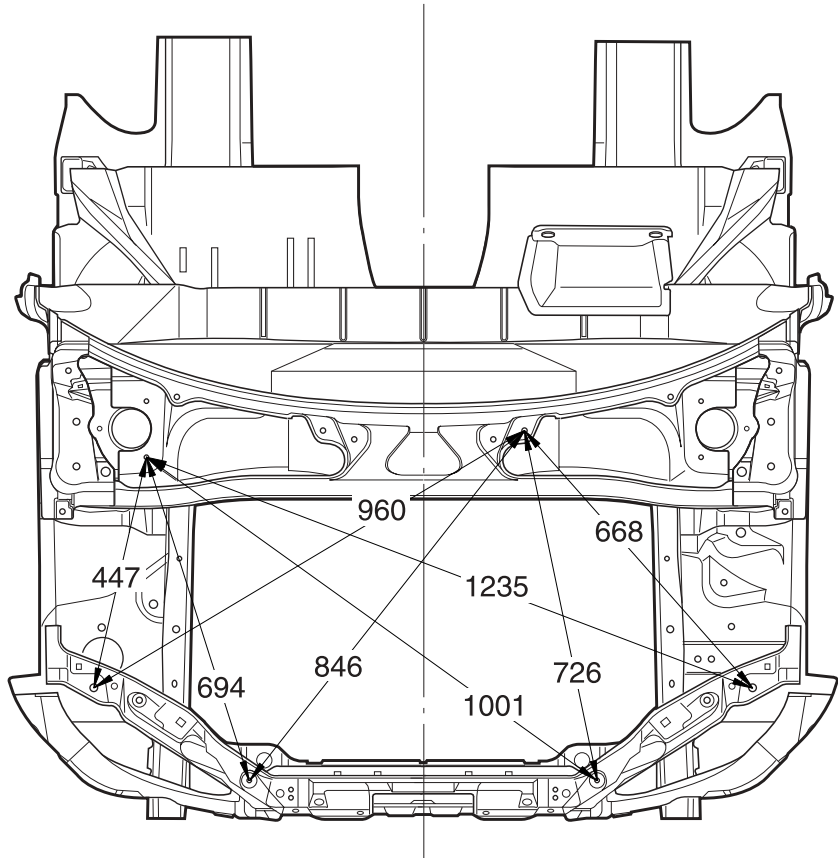


Fig. 8

1-6. SIDE OUTER

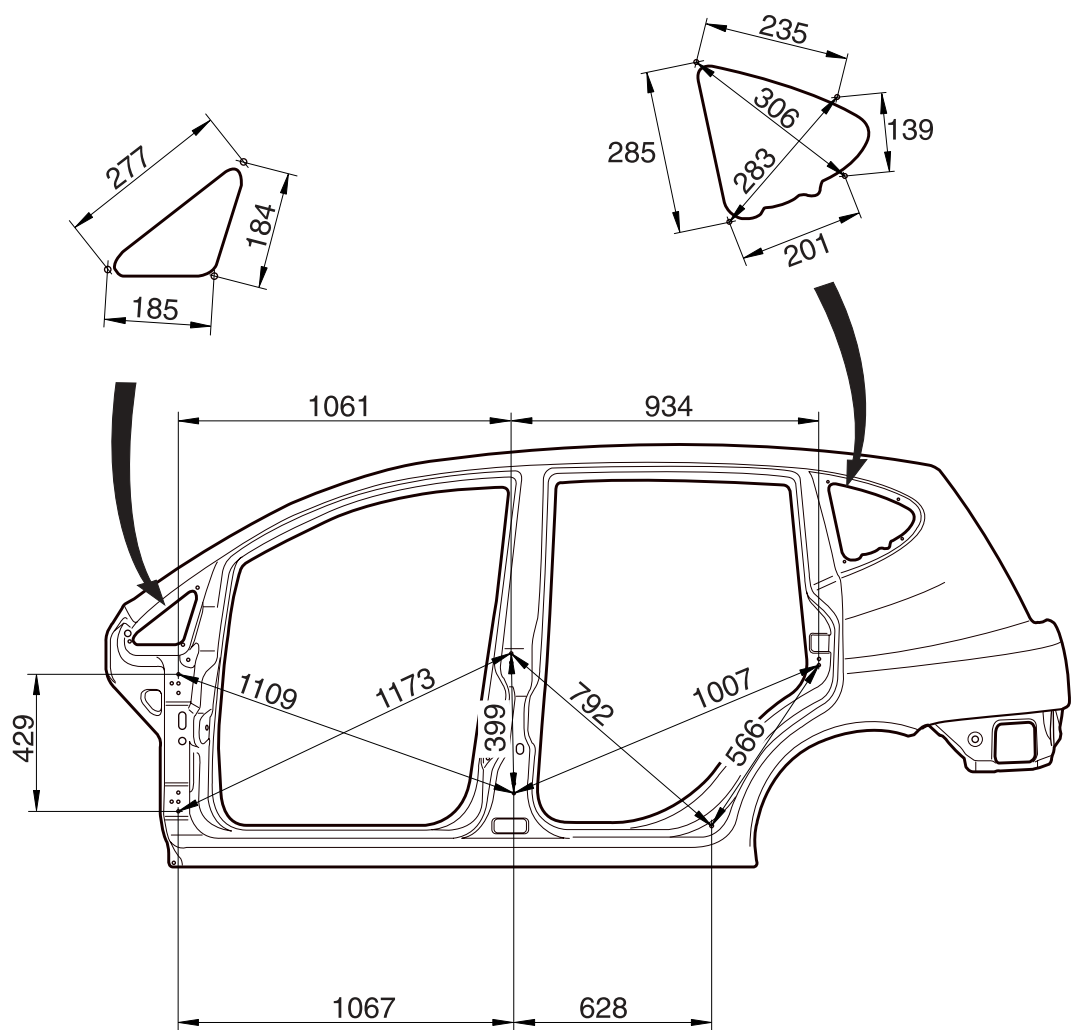


Fig. 9



## 2. BODY WELDING DIAGRAM

### 2-1. FRONT PANEL UPPER

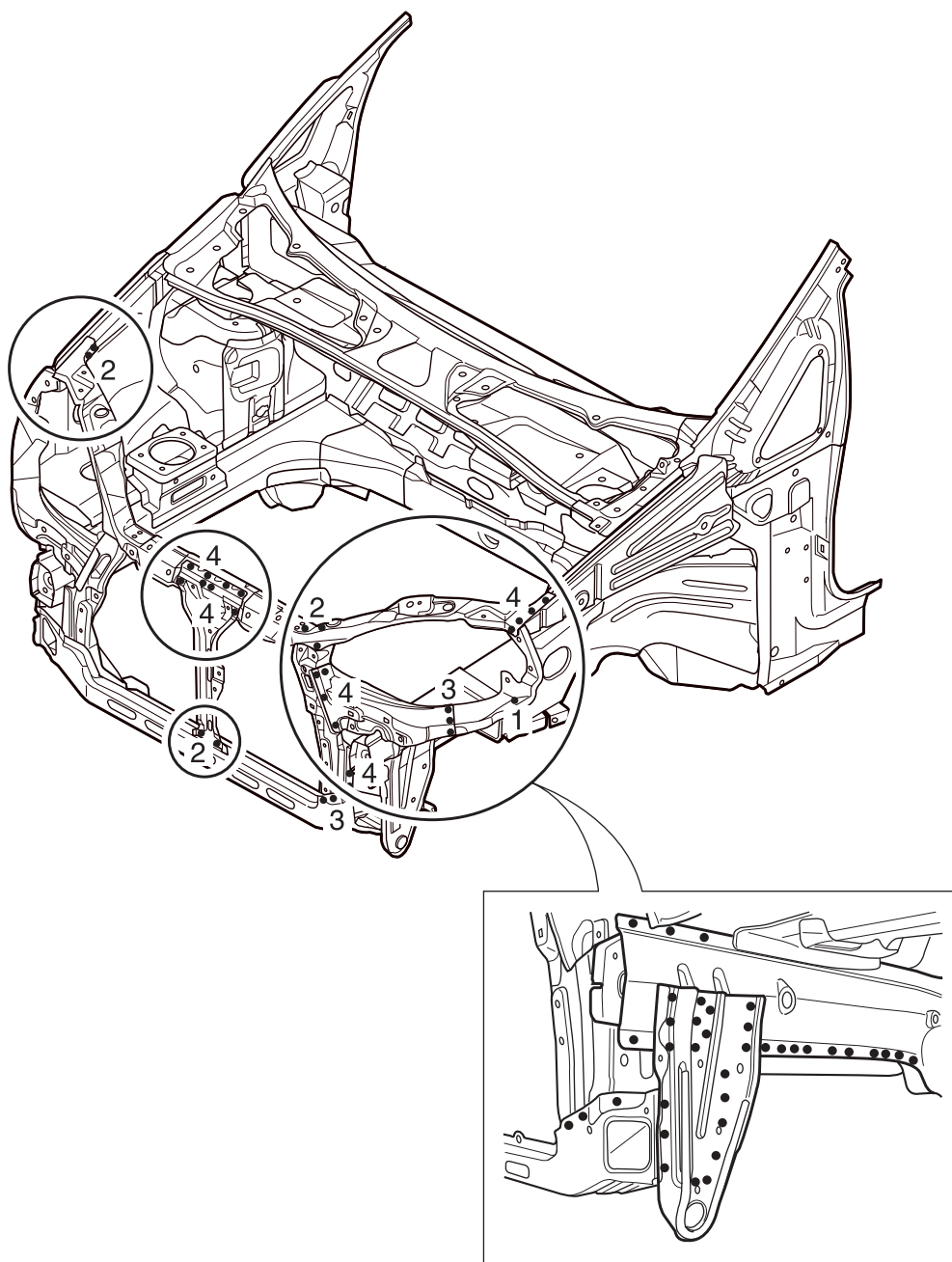


Fig. 10

2-2. FRONT WHEEL HOUSE

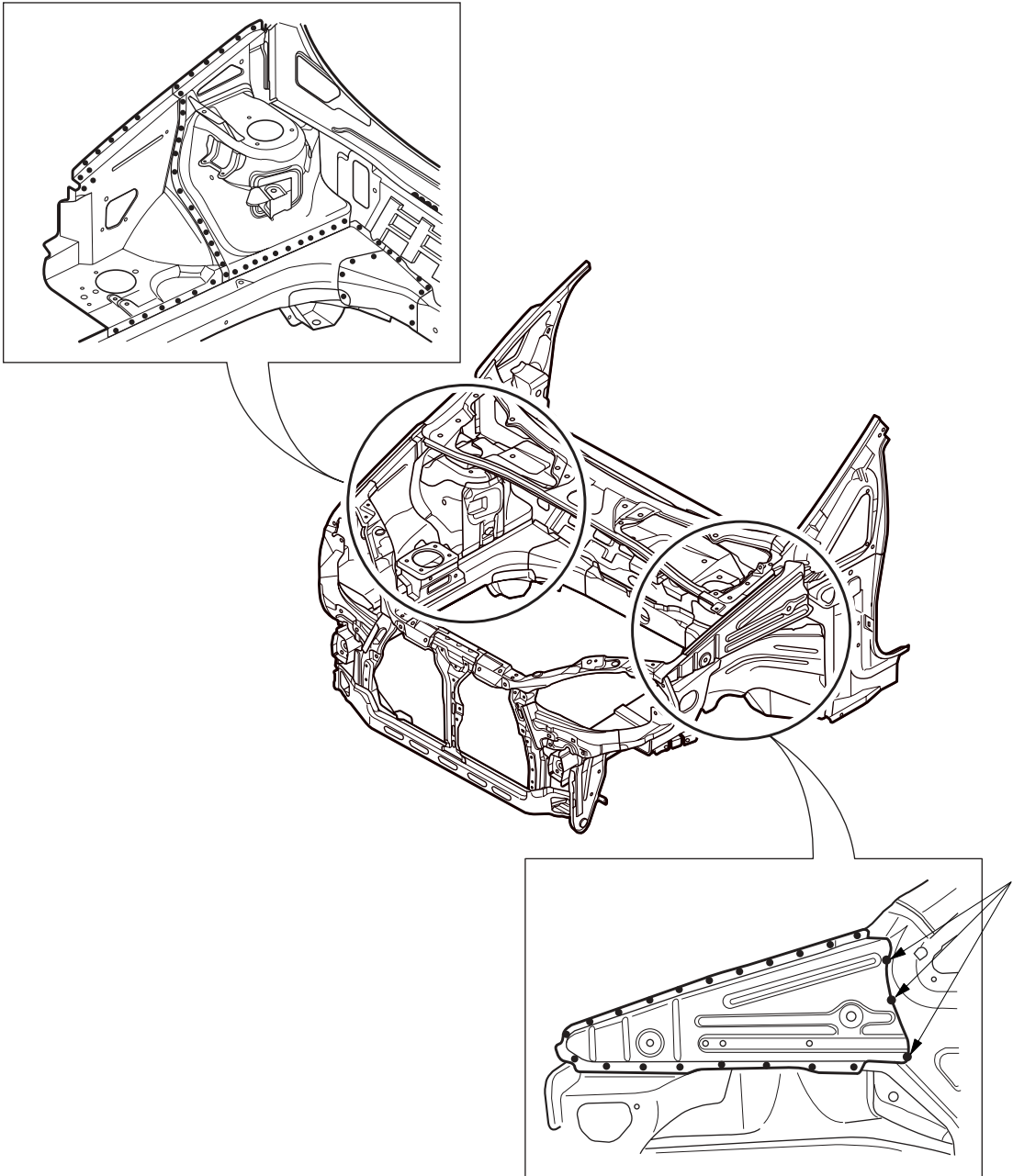


Fig. 11

2-3. BRACE WHEEL HOUSE

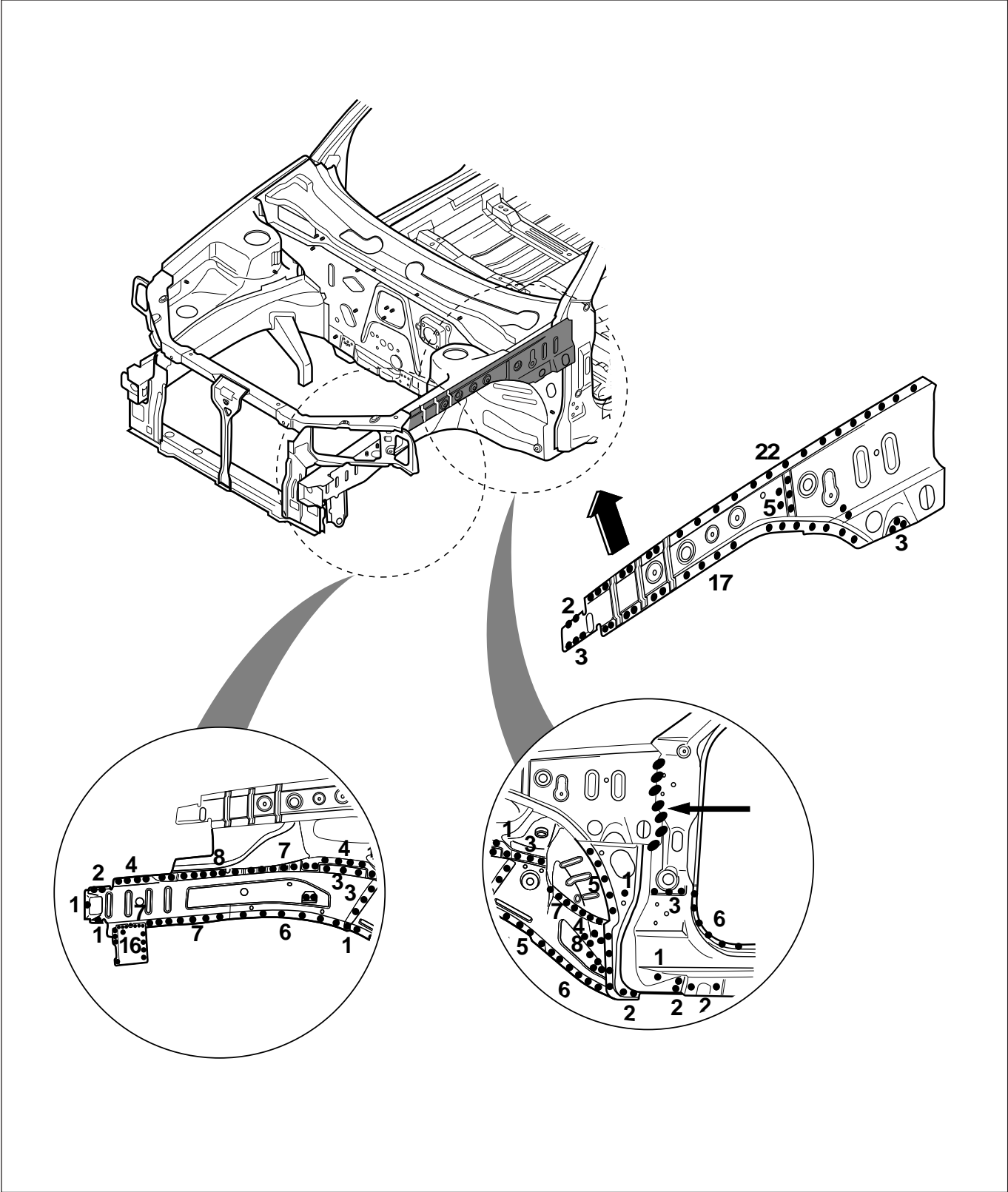


Fig. 12

2-4. DASH PANEL UPPER

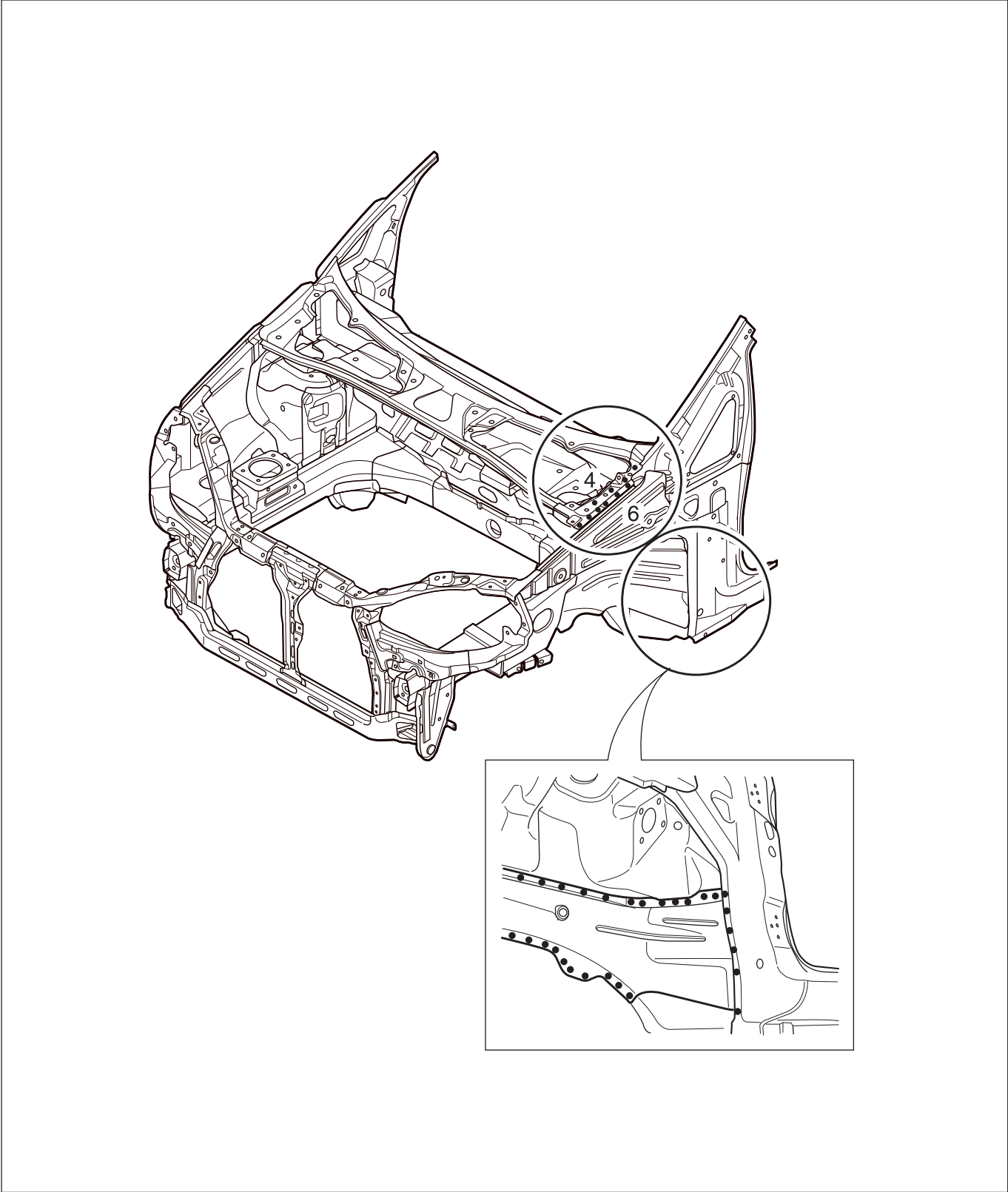


Fig. 13

2-5. DASH PANEL LOWER

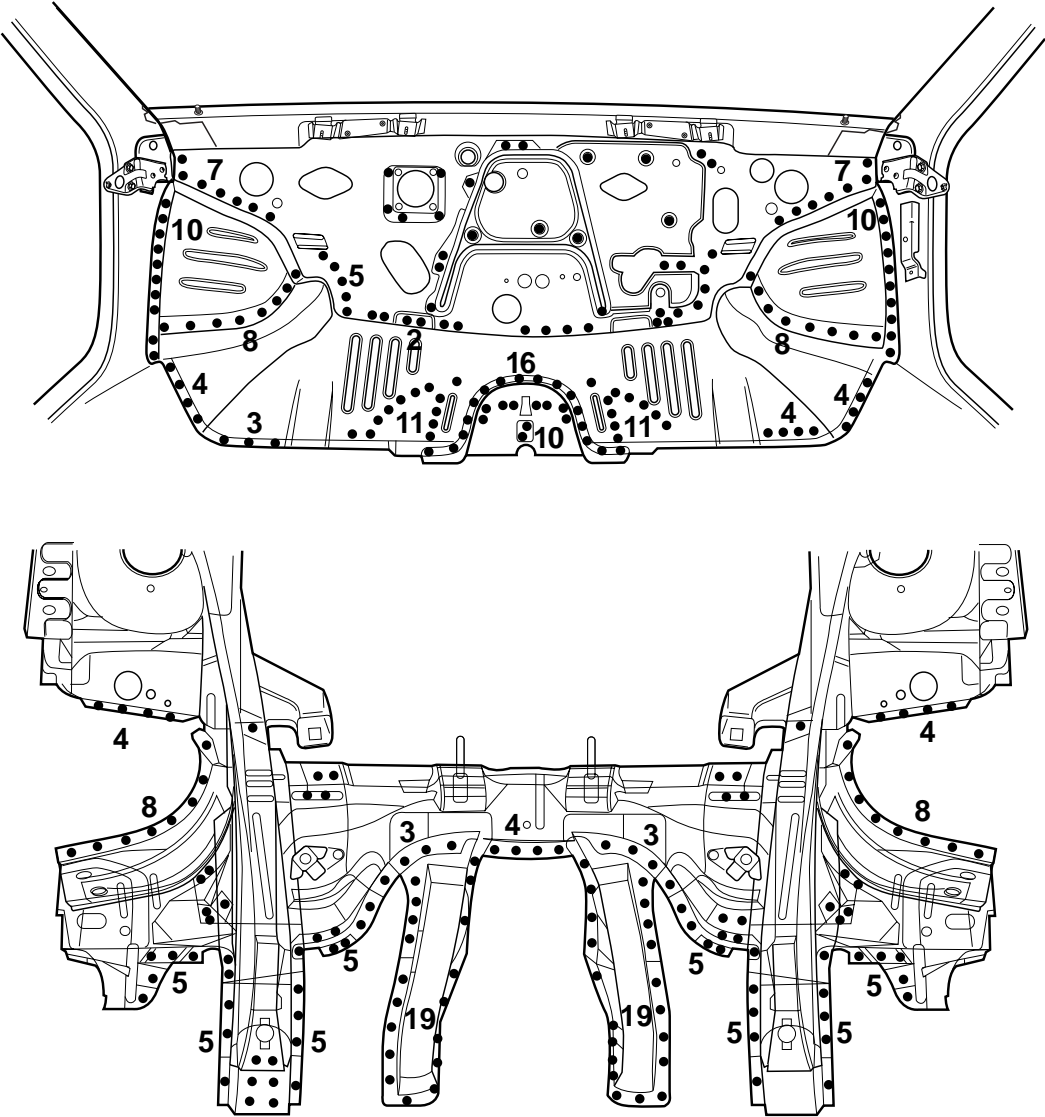


Fig. 14

DASH PANEL LOWER (Continued)

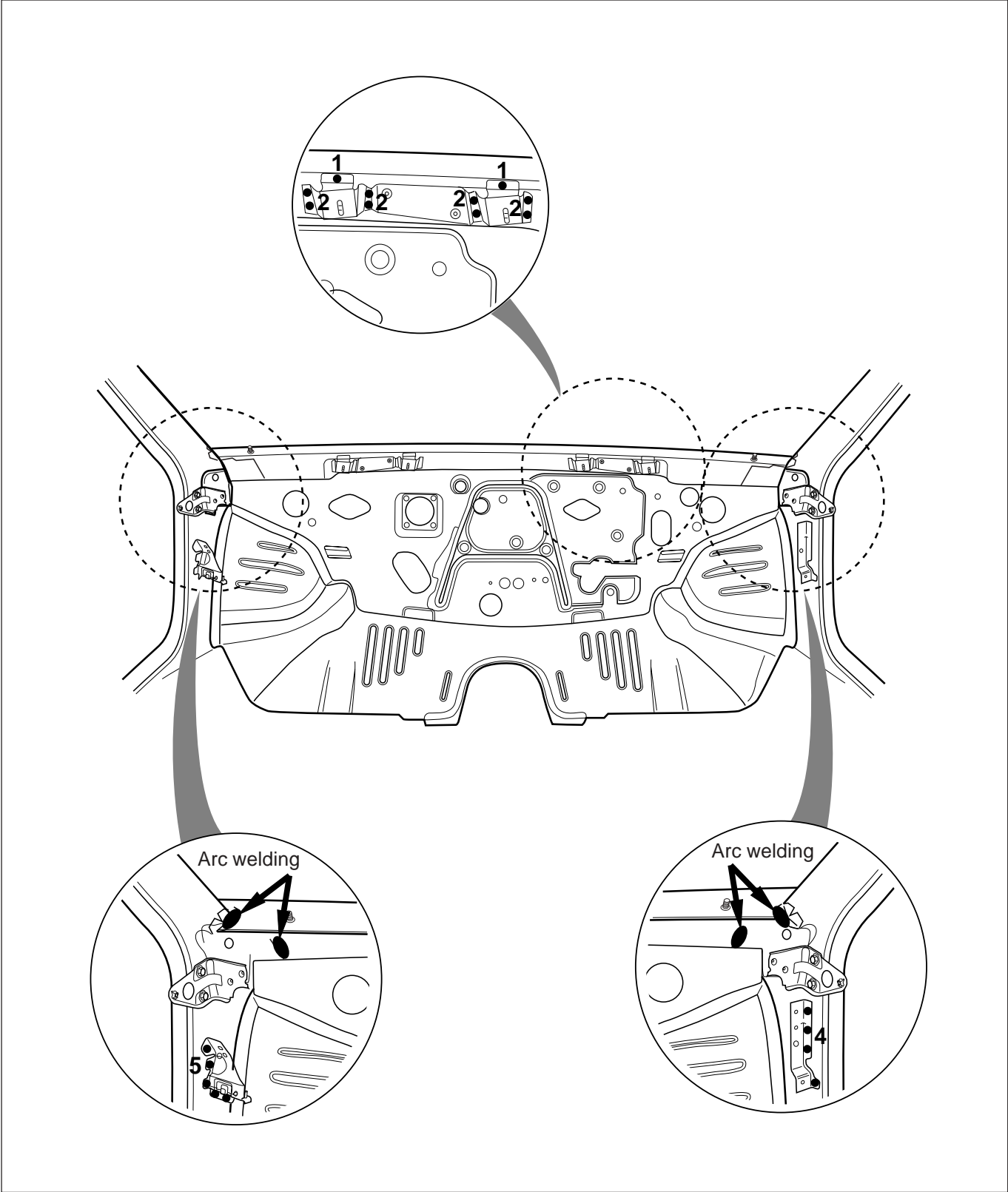


Fig. 15

2-6. ROOF

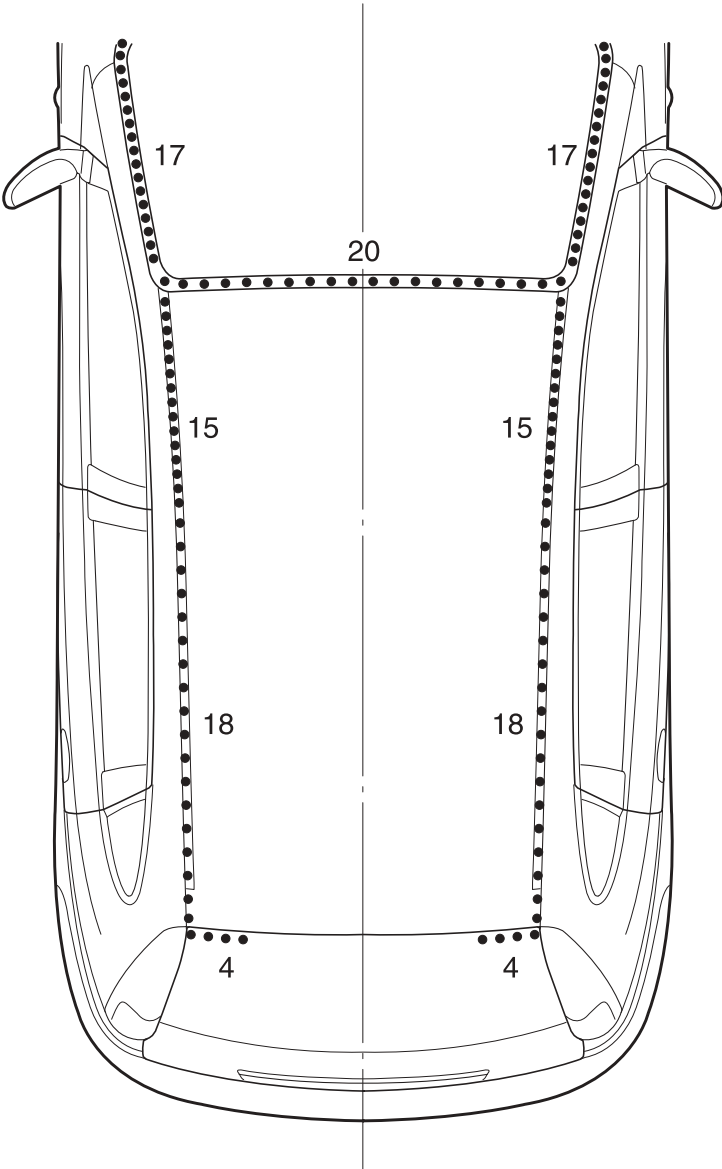


Fig. 16

2-7. BODY SIDE AND WHEEL HOUSE INNER

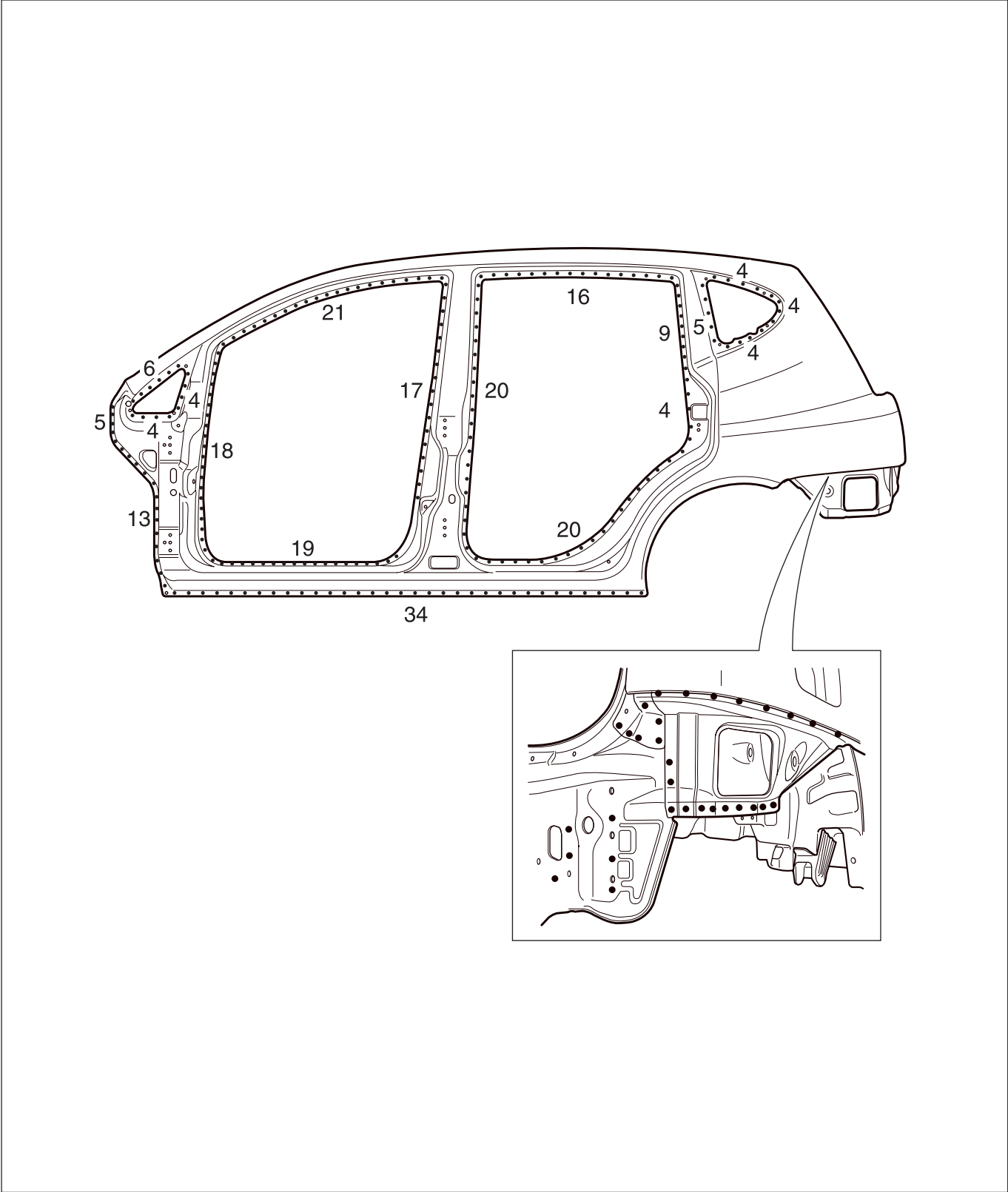


Fig. 17



2-8. REAR FRAME

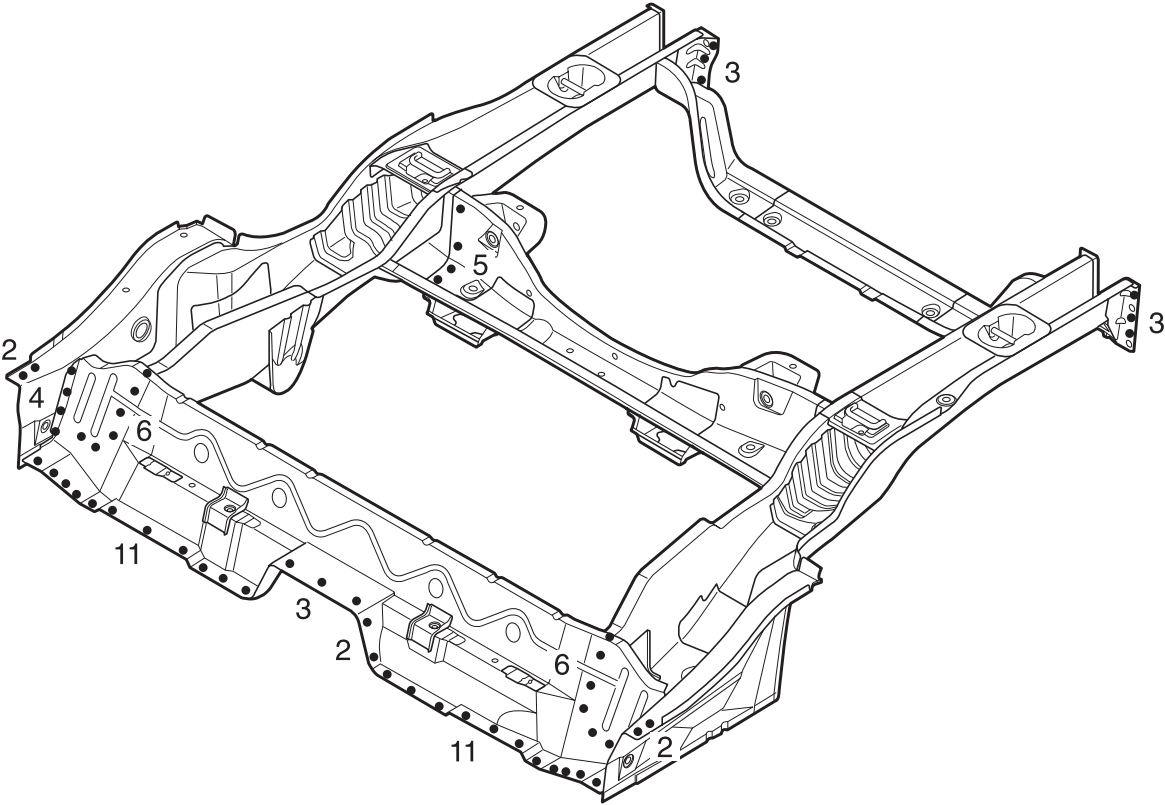


Fig. 18

2-9. TAIL GATE

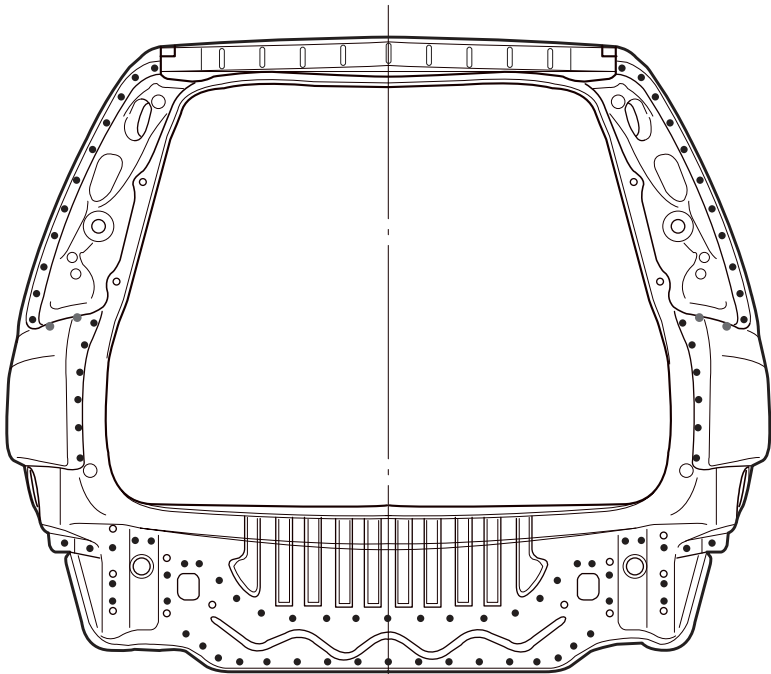
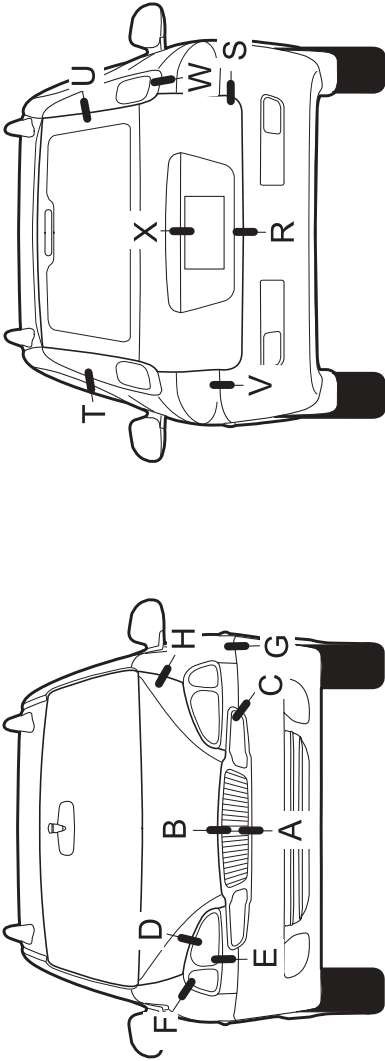


Fig. 19

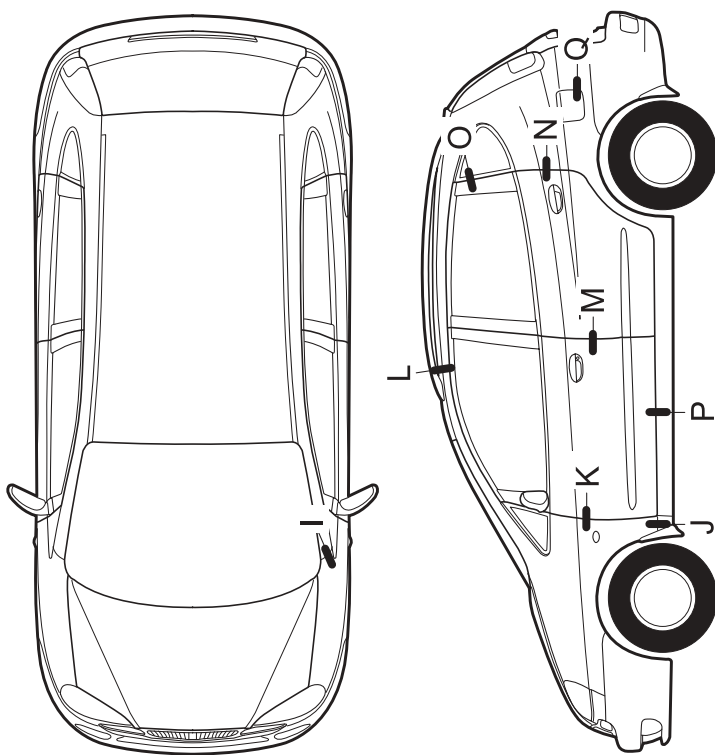
3. GAP CHART

- Check proper installation
- Check clearance and level differences of main body, exterior panels, lamps and bumper
- Check for water leaks in the passenger and trunk compartment



Description	Hood x Front Bumper	Hood x Head Lamp	Hood x Fender	Fender x Head Lamp	Head Lamp x Front Bumper	Side Outer x Trunk Lid	Side Outer x Tail lamp	Trunk Lid x Tail Lamp	Trunk Lid x Rear Bumper	Tail Lamp x Rear Bumper
Location	A	B	C	D	E	F	G	H	I	J
Gap (mm)	5 <sup>+2</sup>	5 <sup>+2</sup>	3 ± 1	2 ± 1	3 ± 1	3 <sup>+1</sup>	1.9	3.5 ± 1	5 <sup>+2</sup>	4 ± 1

Fig. 20



Description	Hood x Fender	Fender x Head Lamp	A pillar x Front Door	Rear Door x Roof	Rear Door x C Pillar	Fender x Front Door
Location	A	B	C	D	E	F
Gap (mm)	3 ± 1	2 ± 1	5 ± 1	5 ± 1	5 ± 1	3.5 <sup>+1</sup>
Description	Rocker Panel x Door	Front Door x Rear Door	Rear Door x Side Outer	Trunk Lid x Side Outer	Side Outer x Tail Lamp	
Location	G	H	I	J	K	L
Gap (mm)	5 ± 1	4 <sup>+1</sup>	4 <sup>+1</sup>	3.5 <sup>+1</sup>	3 <sup>+1</sup>	1.9

Fig. 21

# SECTION 9

# SEALING, CAULKING AND DEADNER

## CONTENTS

<b>1. SEALING &amp; CAULKING .....</b>	<b>9-2</b>
<b>Sealing.....</b>	<b>9-2</b>
• Engine room .....	9-2
• Roof.....	9-5
• Inside Room .....	9-6
• Floor & Trunk Room .....	9-7
• Hood .....	9-8
• Trunk Lid .....	9-9
• Front/Rear Door .....	9-10
<b>Caulking .....</b>	<b>9-11</b>
• Engine room .....	9-11
• Under Body .....	9-12
• Back Panel .....	9-13
<b>2. DEADNER .....</b>	<b>9-14</b>
• General description .....	9-14
• Repair procedure .....	9-14
• Under Body .....	9-16
• Roof, Door .....	9-17

1. SEALING & CAULKING

NOTE: Seal the following areas to prevent air leaks water leaks, and rust.

1.1. SEALING

ENGINE ROOM

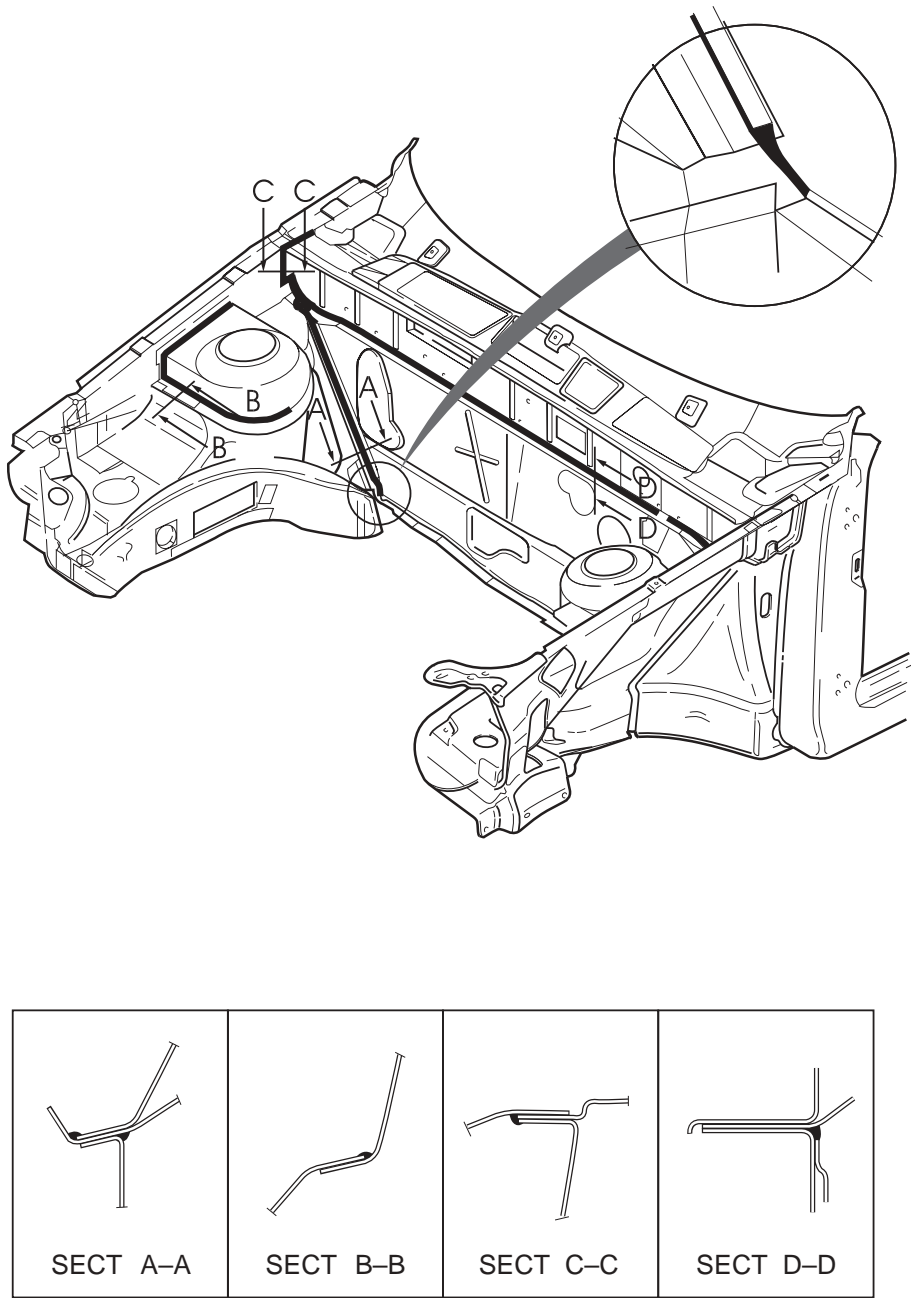


Fig. 1 Engine Room

ENGINE ROOM(Continued)

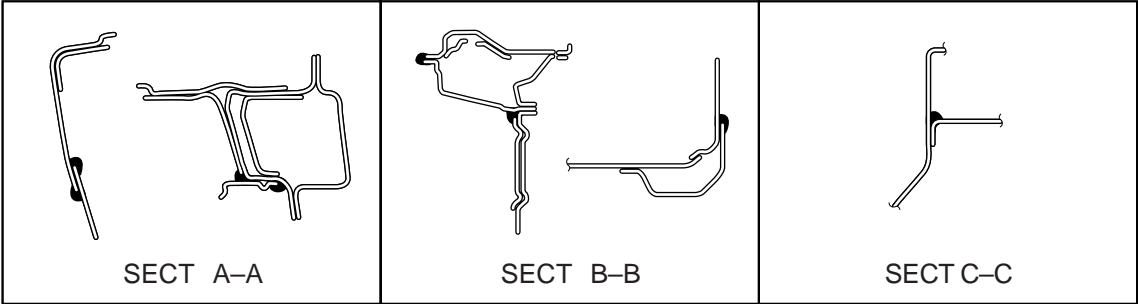
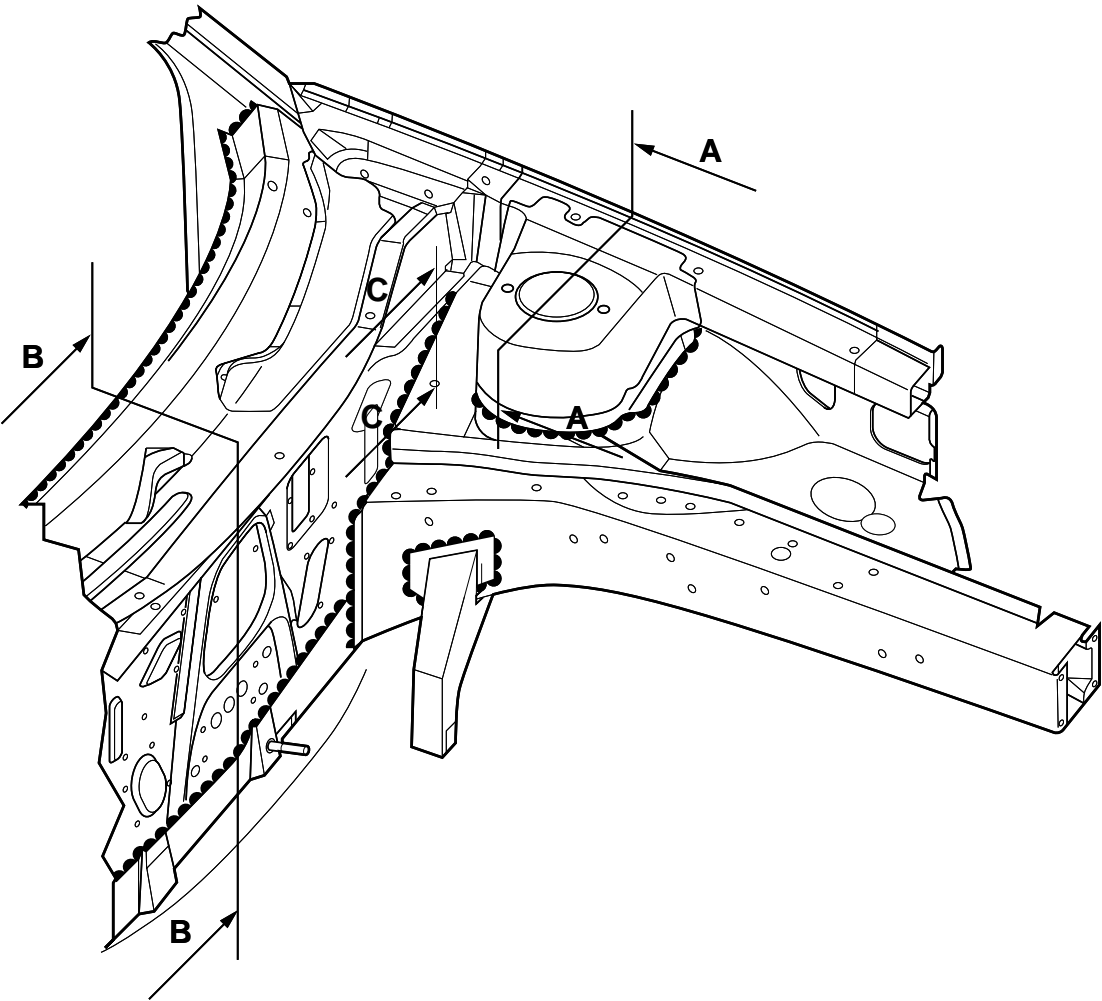


Fig. 2

ENGINE ROOM (Continued)

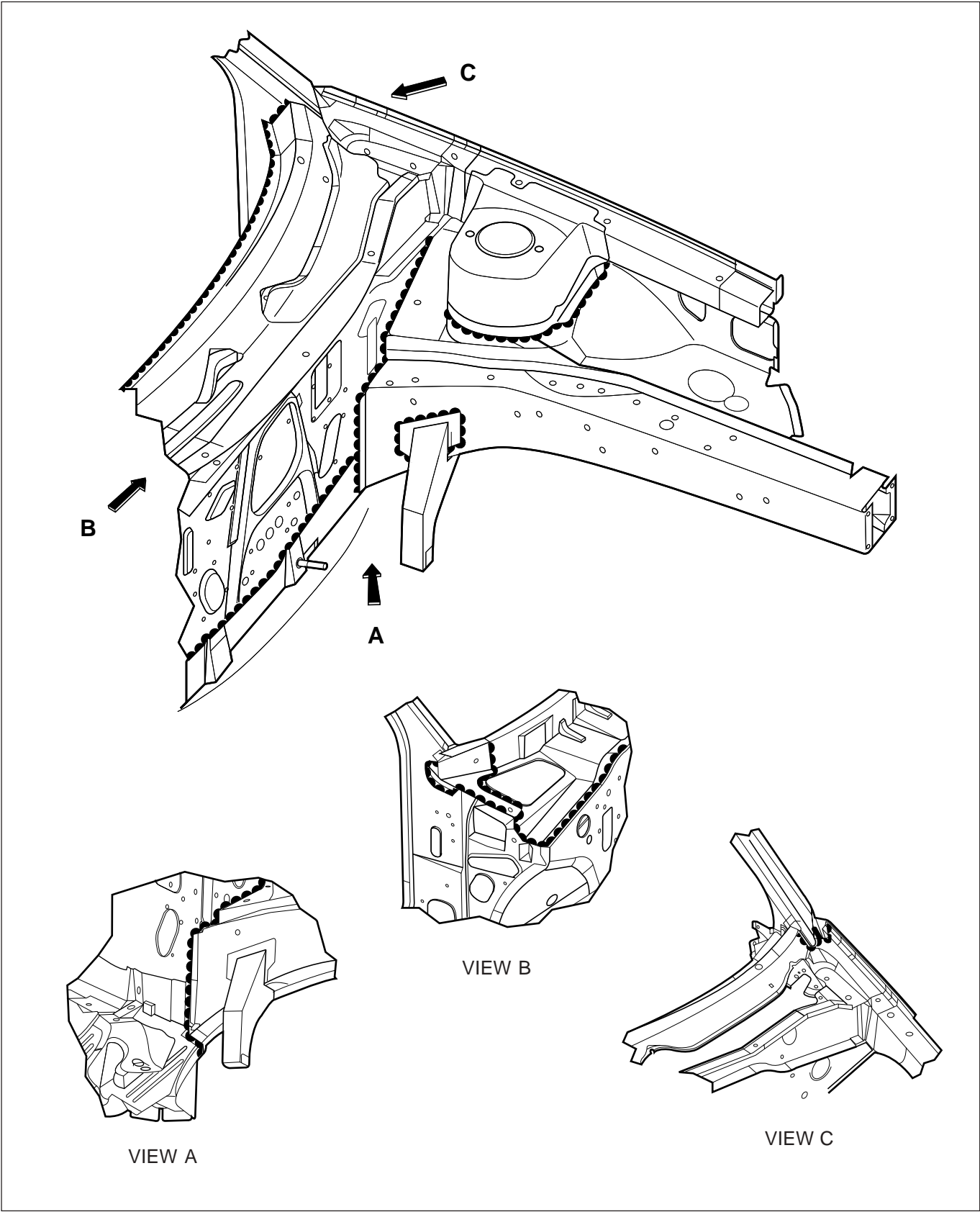


Fig. 3



ROOF

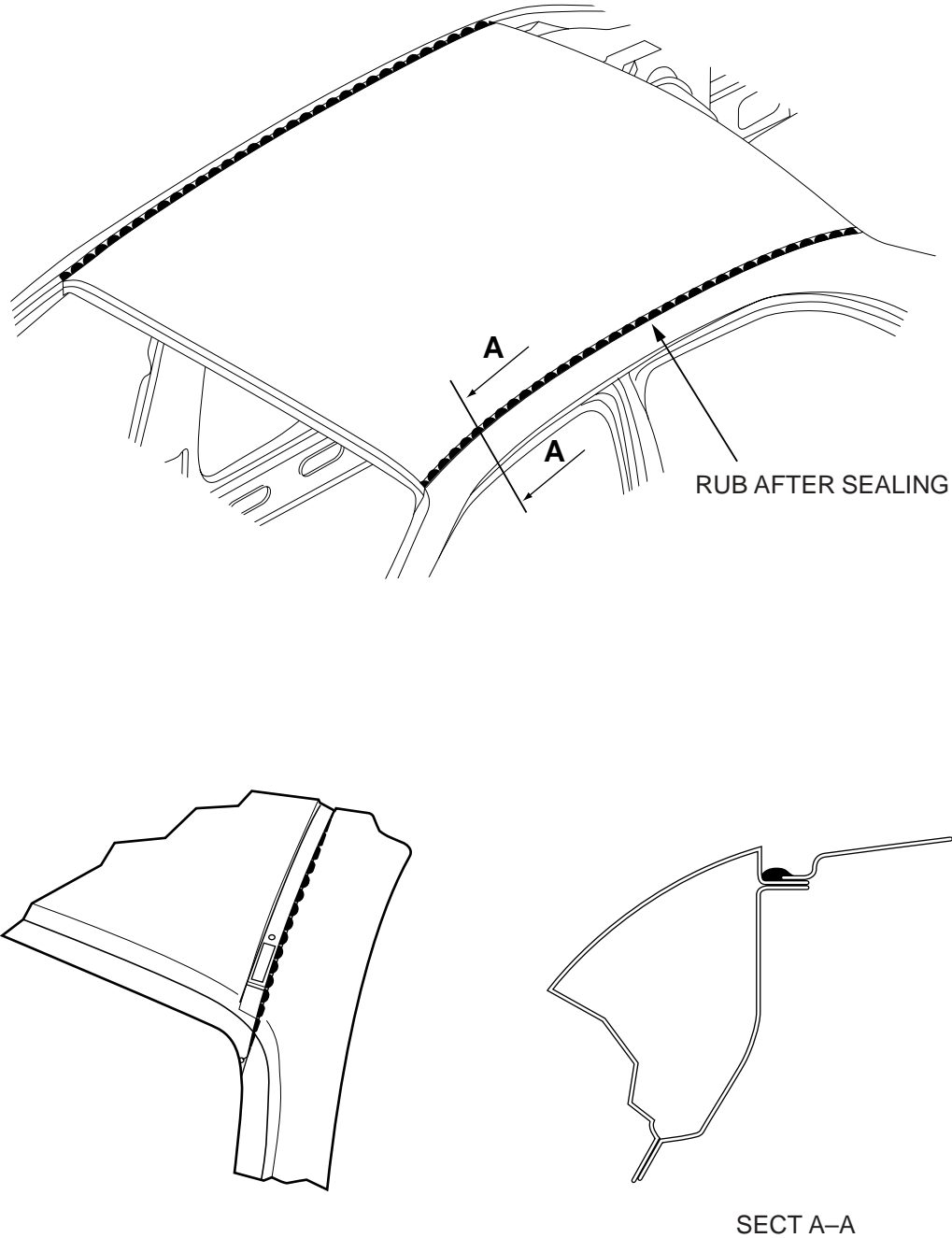


Fig. 4

INSIDE ROOM

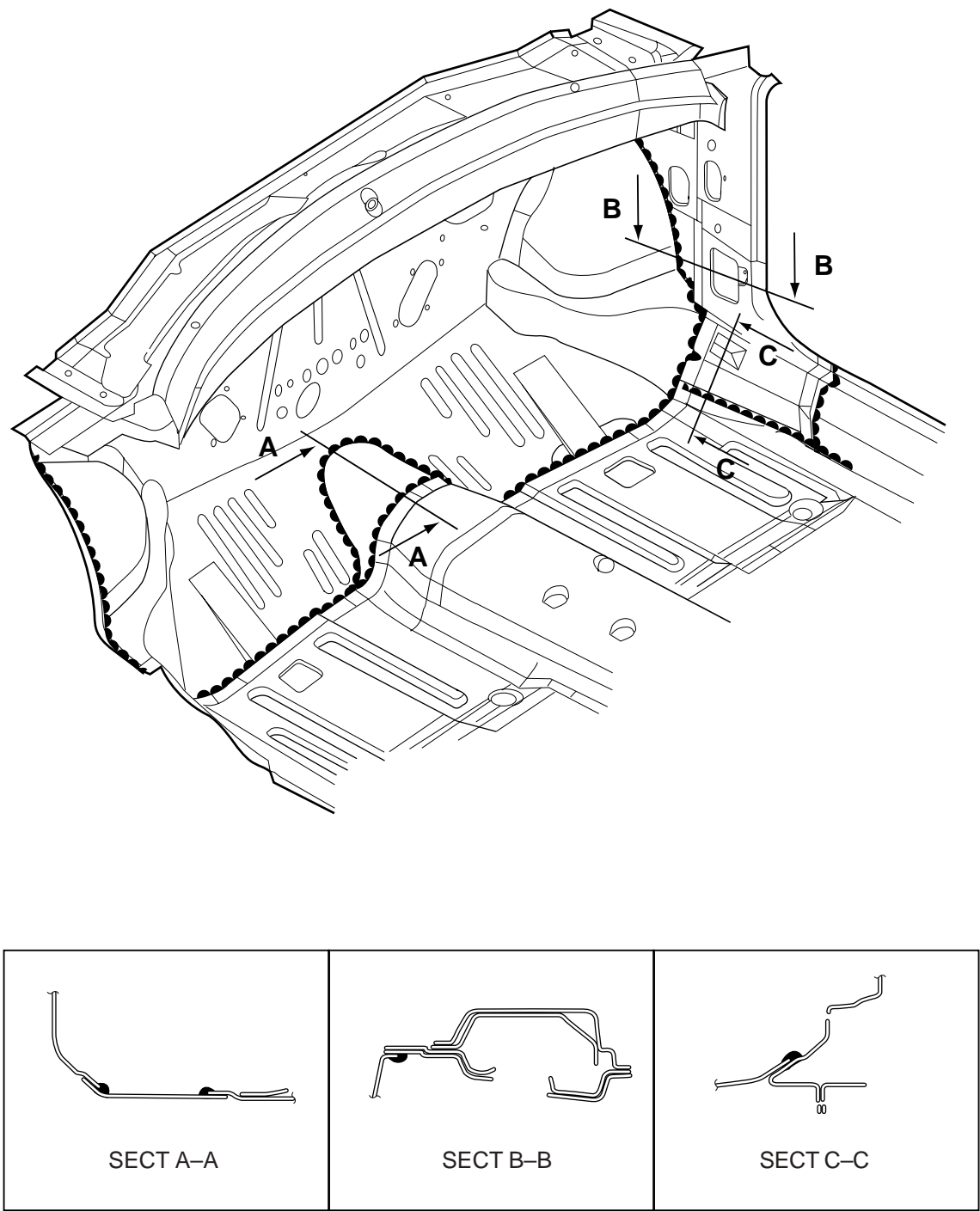


Fig. 5

FLOOR & TRUNK ROOM

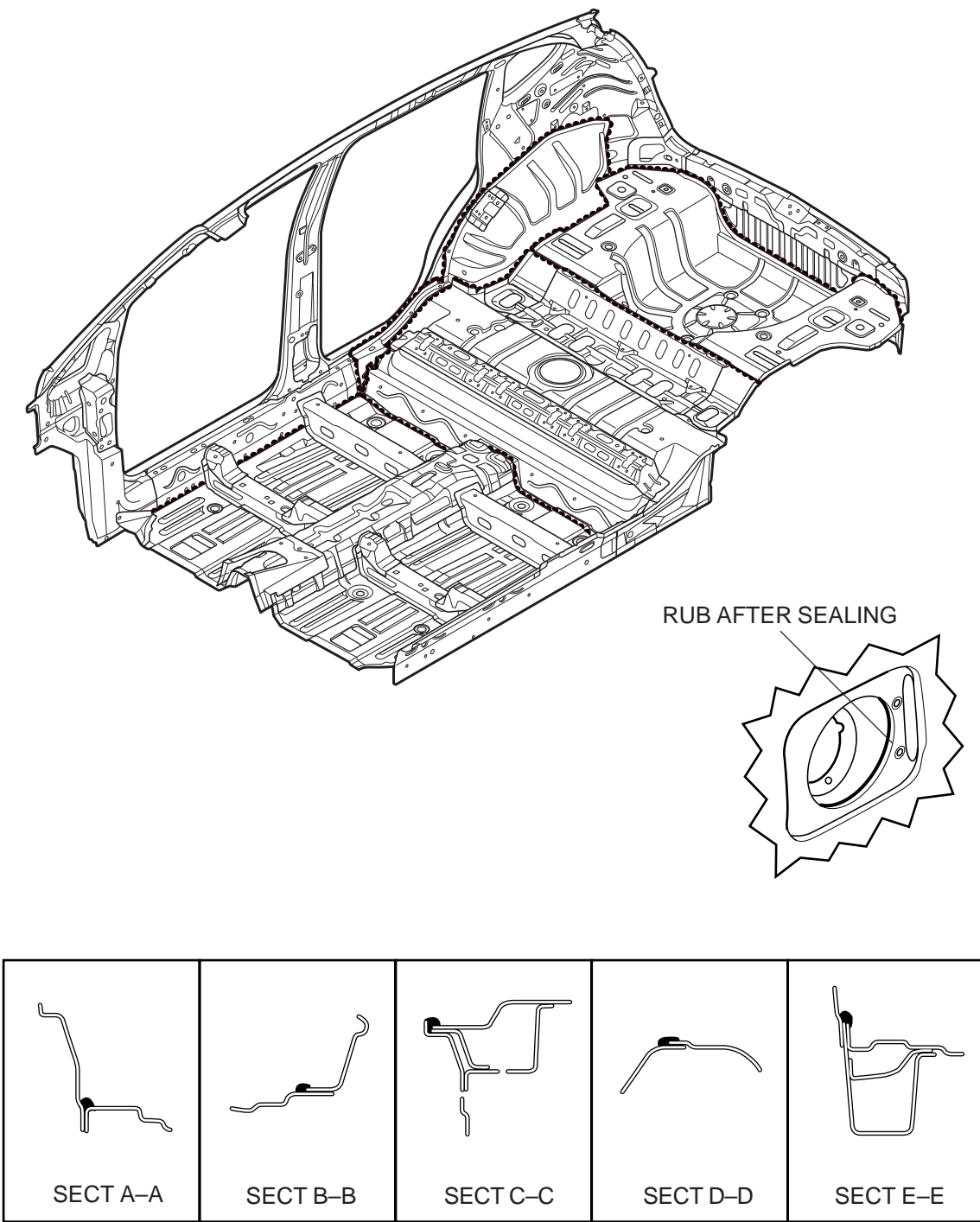


Fig. 6

HOOD

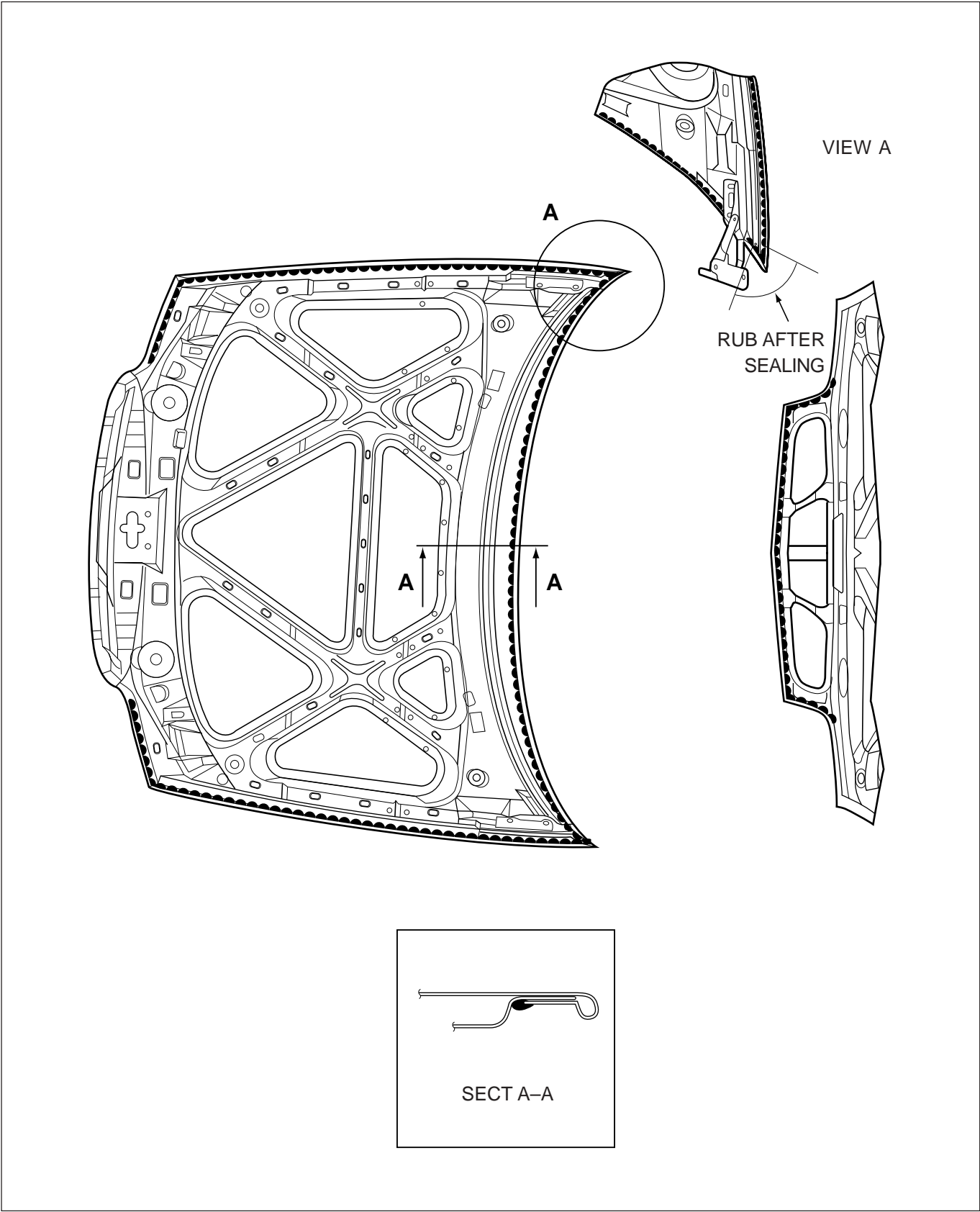


Fig. 7

TRUNK LID

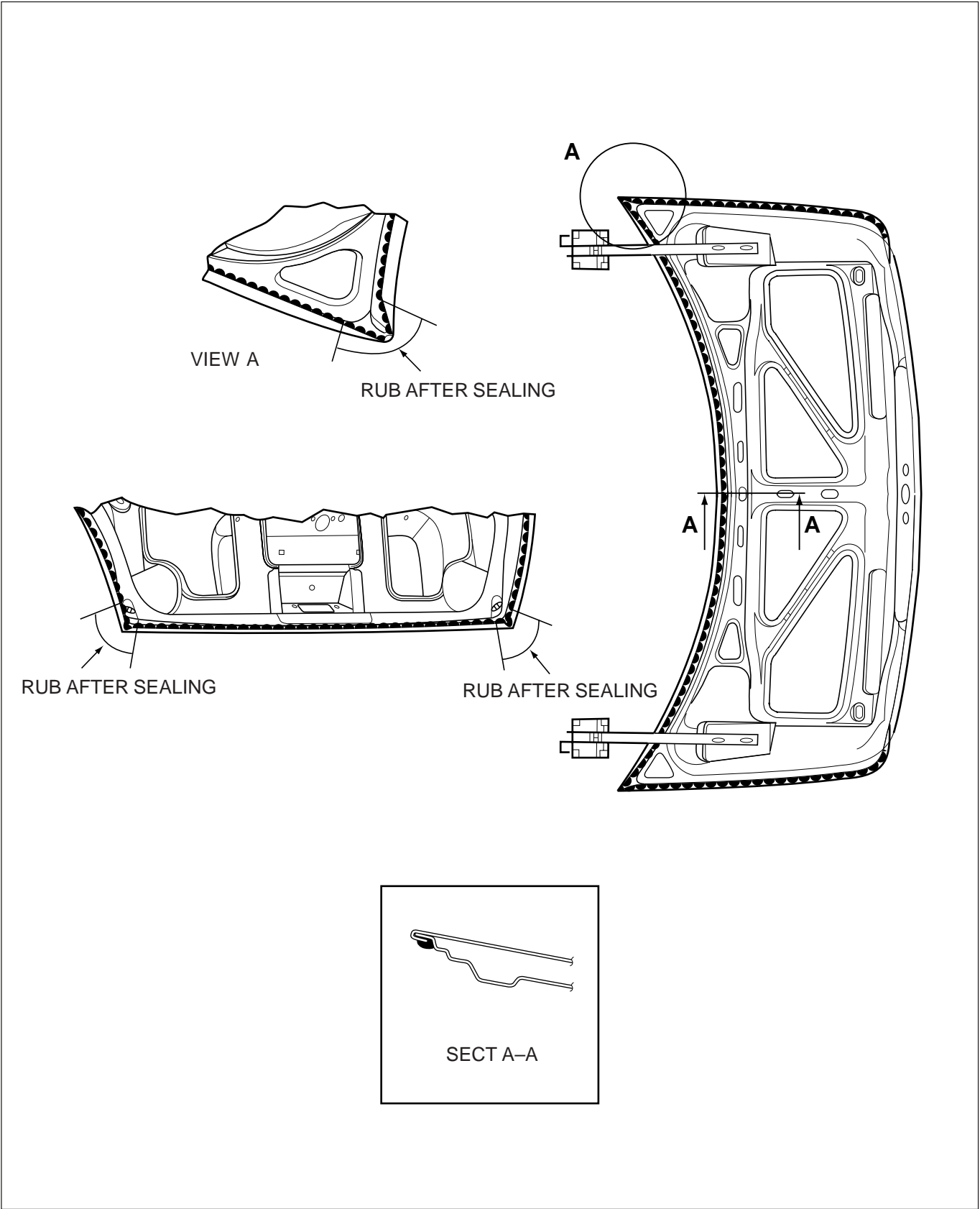


Fig. 8

FRONT / REAR DOOR

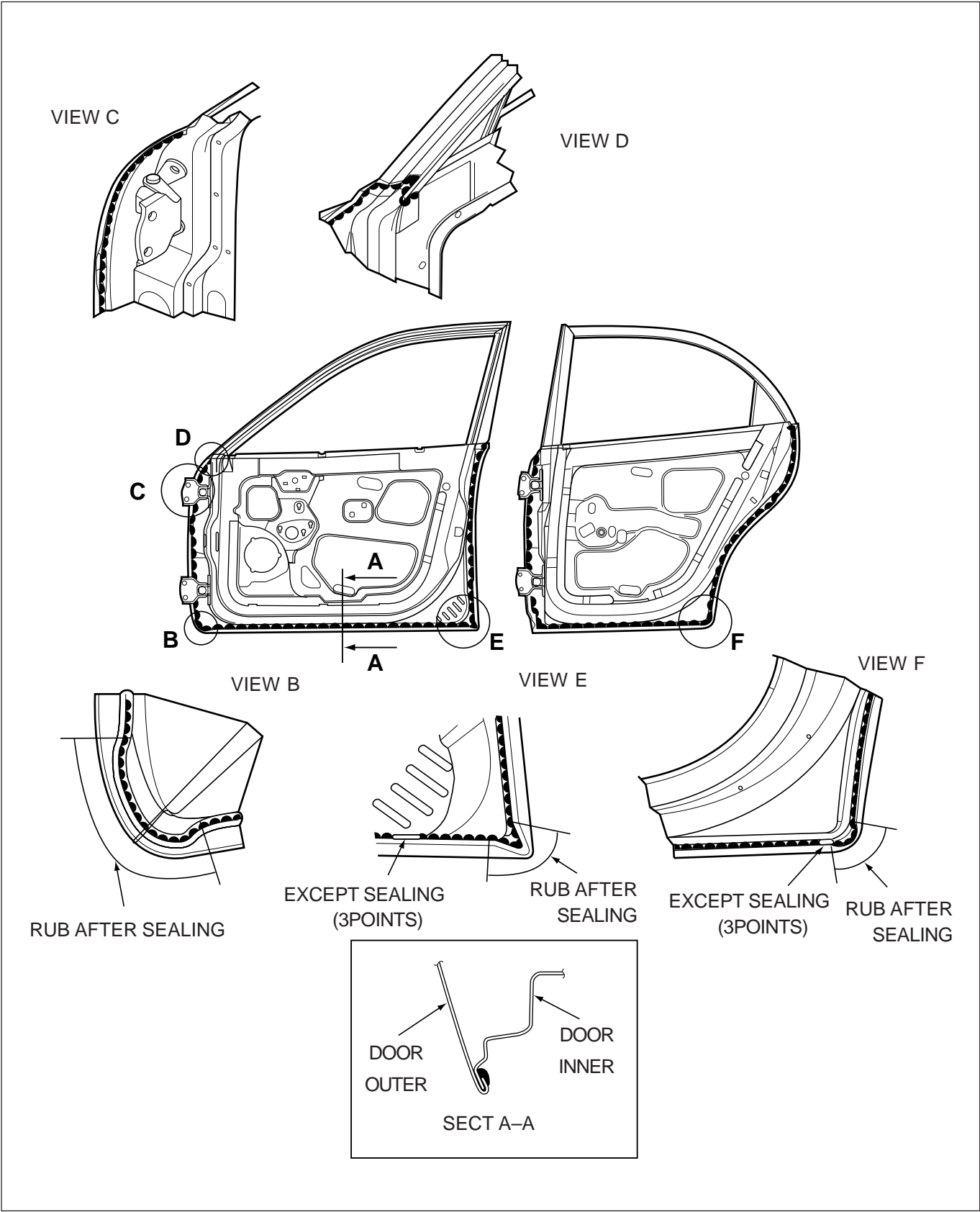


Fig. 9

## 1-2. CAULKING ENGINE ROOM

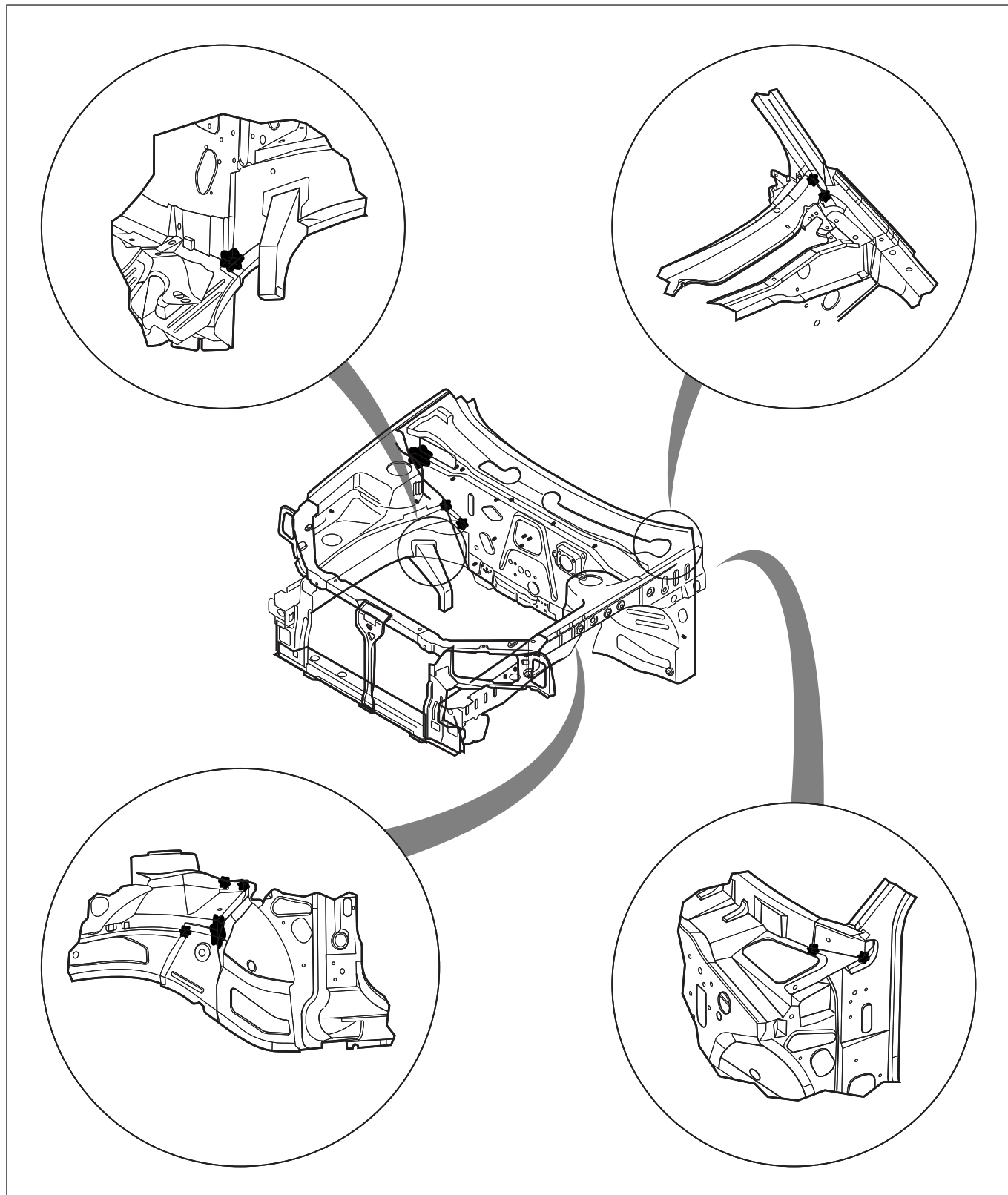


Fig. 10

UNDER BODY

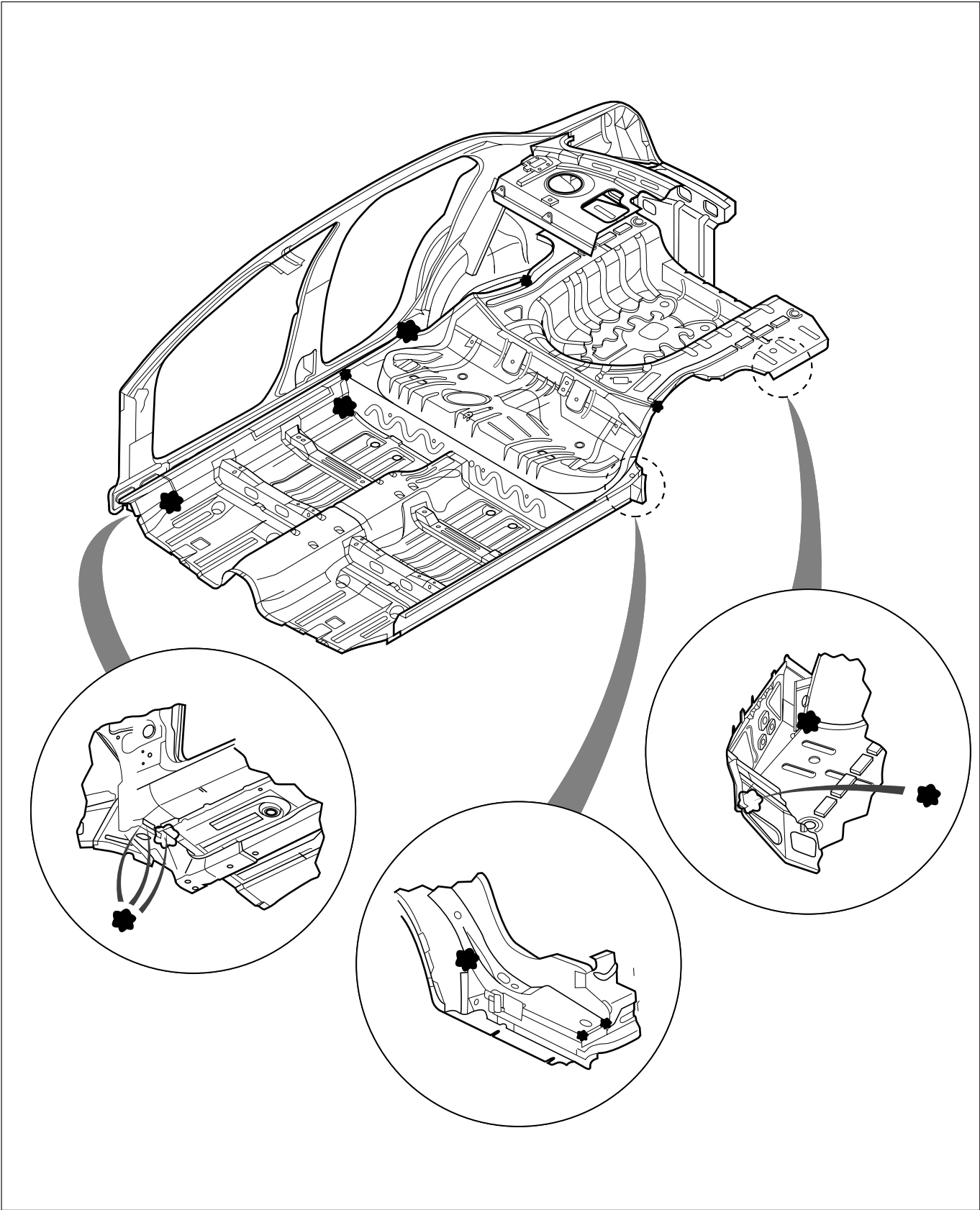


Fig. 11



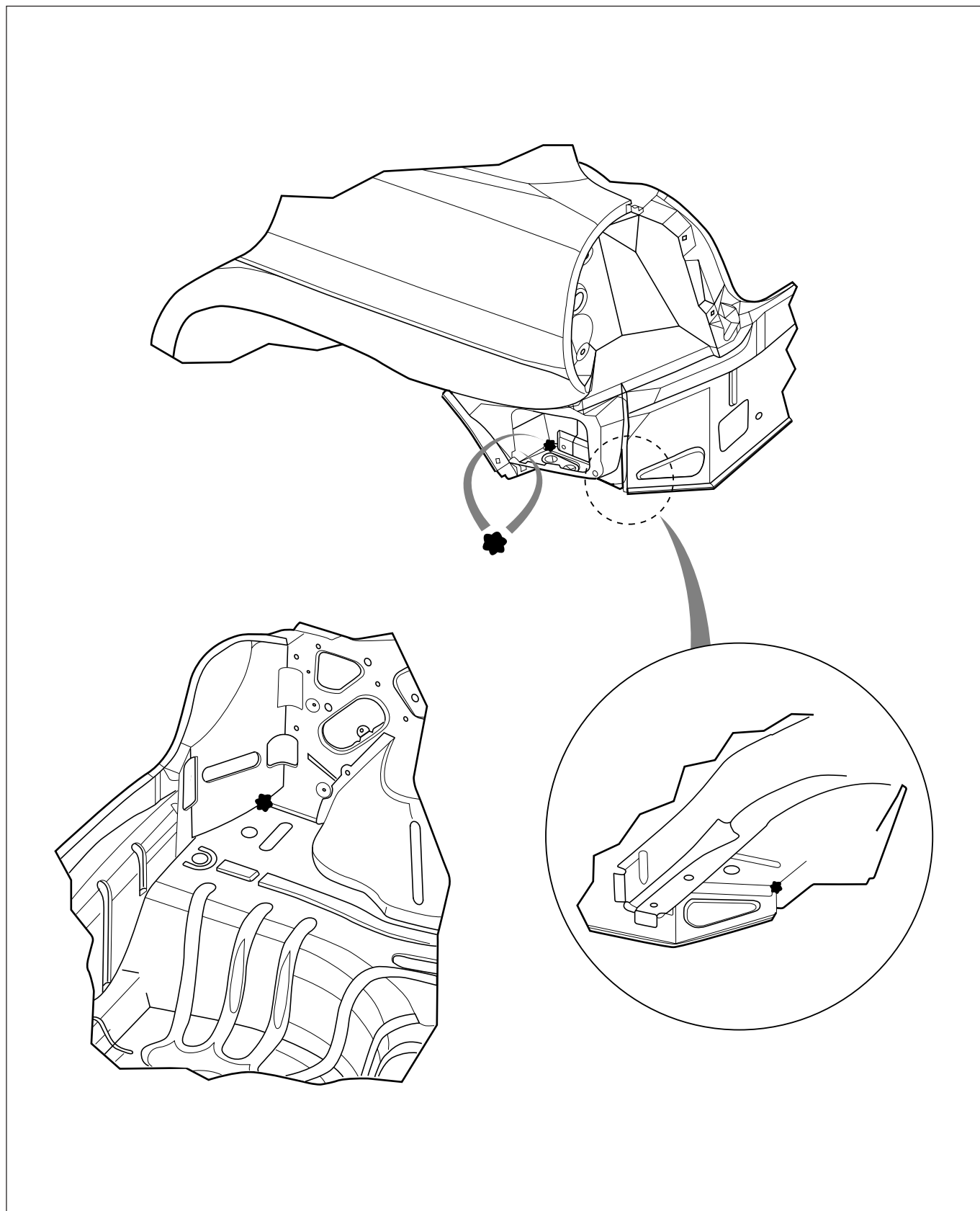
**BACK PANEL**

Fig. 12

## 2. DEADNER

### 2-1. GENERAL DESCRIPTION

Deadner is properly designed and applied for reduce the vibration and noise. Also, it plays in maintaining the structural rigidity of the panel.

### 2-2. REPAIR PROCEDURE

1. Remove the related parts.
  - Seats, carpet.
  - Trims, others.
2. Removal of the damaged deadner.
  - Peel off the damaged deadner with a steel spatula, carefully.
3. Clean and dry.
  - Before applying the deadner, thoroughly clean and dry the areas to be applied.
4. Prelocation the new deadner.
  - Prelocation the new deadner on the panels to be applied.

**NOTE:** Avoid the parts mounting holes and service holes.

5. Adhension of deadner.
  - Heat the surface of deadner with a torch or heating gun until it adheres itself.
  - Push and adhere to the panel with a rubber spatula.

**NOTE:** In order to take full advantage of the deadner, its face must adhere and contact the panels perfectly.

**CAUTION:** Be careful not to burn the composite parts when beating.

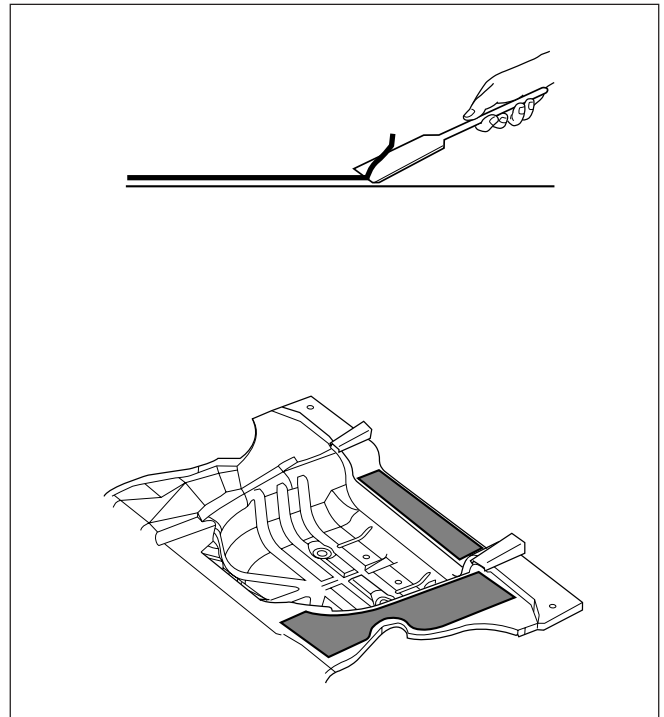


Fig. 13

6. Install the related parts.
  - Install in the reverse order in which they were removed.

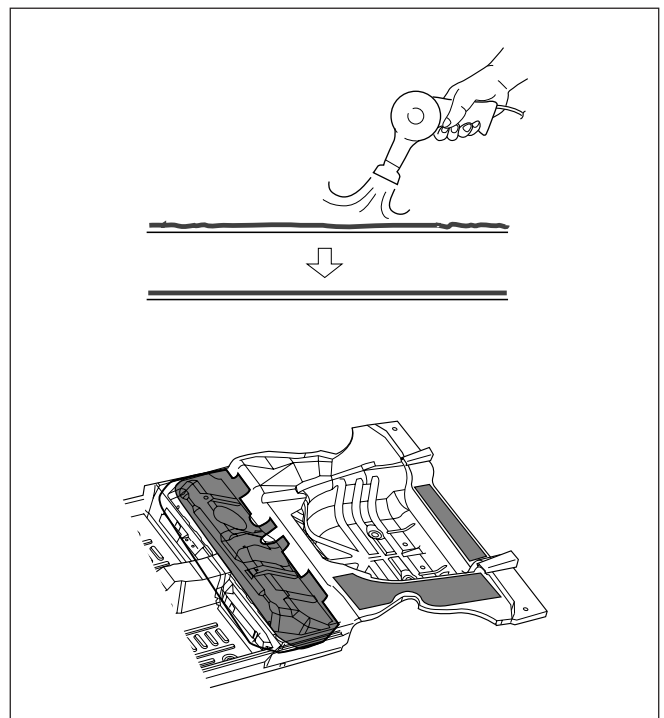


Fig. 14

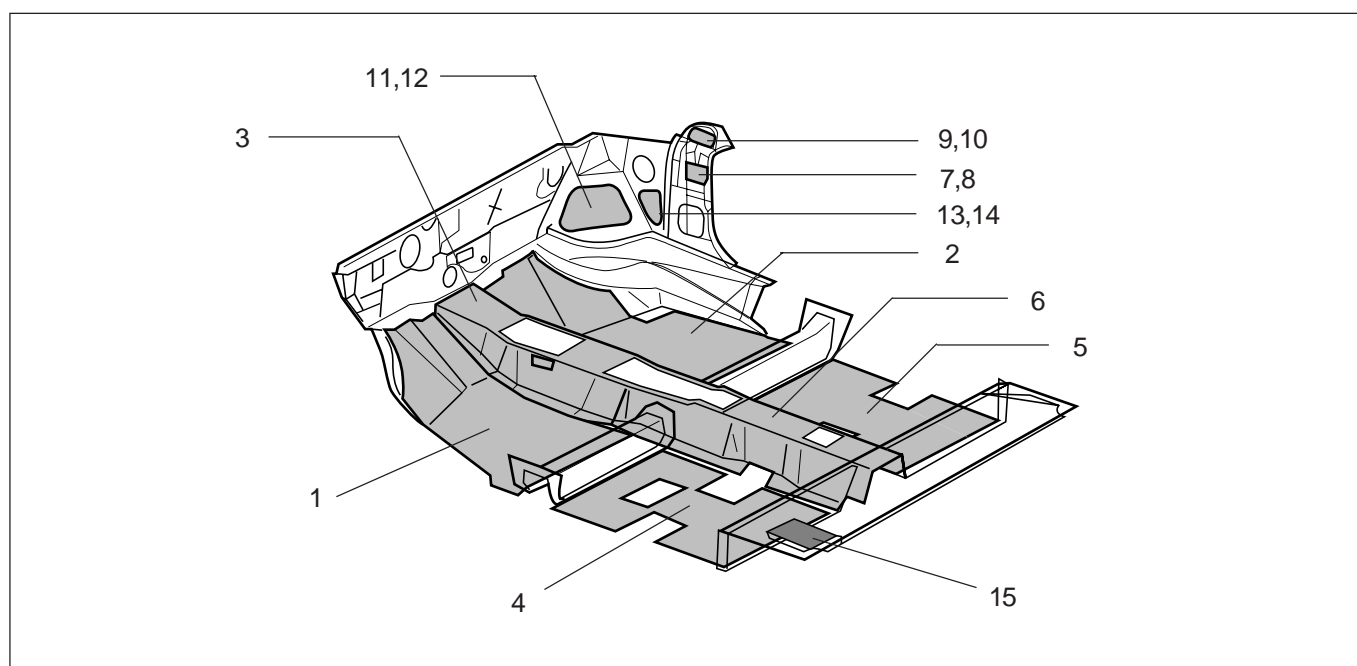


Fig. 15 Deadner Chart

**DEADNER CHART**

Unit : mm

NO	DESCRIPTION	THICKNESS	MAX AREA	REMARKS
1	DEADNER - FLOOR PANEL FRT, LH	4.0	778x428(30.63x16.85)	
2	DEADNER - FLOOR PANEL FRT, RH	4.0	778x428	
3	DEADNER - FLOOR PANEL FRT, TUNNEL	4.0	740x360	
4	DEADNER - FLOOR PANEL RR, LH	2.2	620x520	
5	DEADNER - FLOOR PANEL RR, RH	2.2	620x520	
6	DEADNER - FLOOR PANEL RR, TUNNEL	4.0	625x340	
7	DEADNER - A PILLAR LH	1.5	140x80	
8	DEADNER - A PILLAR RH	1.5	140x80	
9	DEADNER - A PILLAR UPPER LH	1.5	70x50	
10	DEADNER - A PILLAR UPPER RH	1.5	70x50	
11	DEADNER - FRT WHEEL HOUSING LH	3.2	264x165	
12	DEADNER - FRT WHEEL HOUSING RH	3.2	264x165	
13	DEADNER - A PILLAR LH	1.5	140x80	
14	DEADNER - A PILLAR RH	1.5	140x80	
15	DEADNER - TRUNK SIDE, LH	3.2	300x200	RECTANGULAR

UNDER BODY

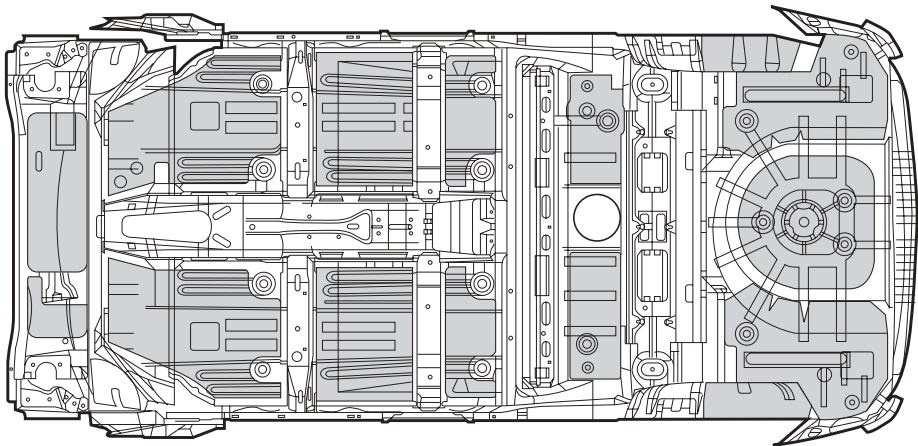


Fig. 16

## ROOF, DOOR

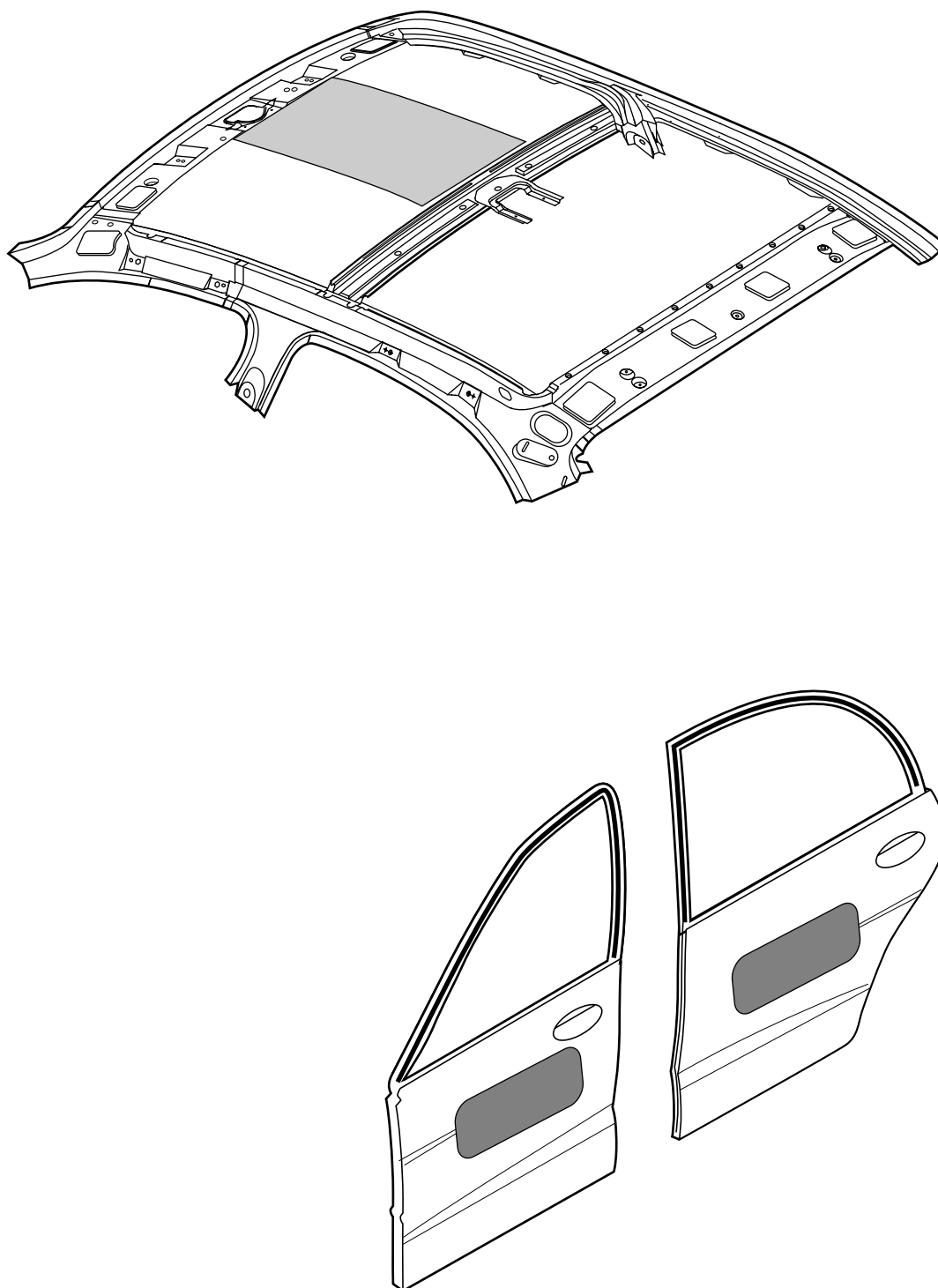


Fig. 17

## **BODY REPAIR MANUAL (TACUMA/REZZO)**

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**ISSUED BY  
OVERSEAS SERVICE DIVISION  
DAEWOO MOTOR CO., LTD.**

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